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RAILWAY PROTECTIVE ASSOCIATIONS AS COMPARED WITH INSURANCE.

BY JAMES M. GARDNER.

(Written for the AMERICAN RAILROAD JOURNAL.)

UPON a casual perusal of the various journals published in the interests of the different railway protective and benevolent associations, I have been much struck with the good work they have accomplished in providing death funds and periodical payments in case of accident or illness. Apparently not a single claim has been presented for pecuniary aid of this nature that has not been promptly met with payment, and the usefulness of the organizations is thus unquestionably demonstrated. The mutual pledge of men engaged in the same calling to aid each other in times of distress is one of the pleasantest features of associated labor, and no greater incentive exists for the encouragement of generosity and personal honor than the system of mutual benefit associations.

The superior intelligence of railway employés in almost every capacity, doubtless has great weight in rendering the advantages of this mutual aid so marked and successful; and for that very reason it is quite possible that they have misunderstood the nature of the aid which they furnish and receive. Under the principle of assessments, by which, I presume, these beneficiary funds are collected, each man by his contributions in aid of others, is entitled to receive aid when his own need for it is presented. Notwithstanding the benevolent features of the organization of which he is a member, the element of business is nevertheless present. He is *buying* something with every assessment he pays, and it would be well for him to consider the nature of the thing purchased. At the outset I will state that he is not buying insurance in its proper sense.

Among men of that class which are fairly represented by railway employés—whether they be locomotive engineers, firemen, conductors, brakemen, trackmen or car-builders—legitimate life insurance companies find great difficulty in obtaining policy-holders. Their agents and canvassers are met with the statement that the person whom they approach is already insured by being a member of this or that railway benefit association or brotherhood, and therefore has no occasion to take out policies of either life or accident insurance in any of the numerous companies doing a general business. I have no doubt that this membership will, in the majority of cases, answer nearly every purpose of a policy of insurance, and as little doubt that the benefit and protective associations are conducted with as scrupulous honesty as the best life insurance companies; but its members should not confound the aid which is promised them, with insurance, for it is a very different thing. A railway employé should by all means become a member of the association composed of fellow-workers, but he should also, if possible, insure in some insurance company of good standing. Thus he will be the recipient of two kinds of protection, which, while designed for the same ends, are entirely dissimilar in their nature and operation.

The aid promised by the benefit association, to the family of the member in the event of his death, and to himself in case of accident or illness, is a guaranteed aid, not an insurance. In the majority of cases it will answer the purpose for which it was intended, but it has not the permanence which characterizes insurance. If the member abandons his connection with the association, either through choice, expulsion, or change of occupation with which his previous membership is incompatible, he at the same time abandons all claims to future aid, and thus forfeits all the advantages which his payments in the past had secured to him. Through some misfortune he may be unable to meet an assessment while still a member of the association, and we presume that in accordance with the usual custom of such organizations he cannot realize any benefits while his payments are in arrears. There are, perhaps, a number of these organizations which do not collect the benefit funds by means of assessments, payment in this case being made direct from the treasury which is constantly replenished by means of fixed weekly, monthly or yearly dues; but the fact nevertheless remains that an abandonment or deprivation of membership in the association is accompanied with a forfeiture of all future benefits which past payments have secured. In legitimate insurance this is not the case. In nearly all of the States, stringent laws have been passed which preclude the possibility of forfeiture under any circumstances save that of deliberate fraud on the part of the policy-holder; and it is the universal practice of all reputable insurance companies to provide various ways by which returns of one kind or another are absolutely assured upon the payment of the second or third yearly premium, no matter if the insured sees fit to let his policy lapse immediately thereafter. This return may be in the form of what is called a "cash surrender value" in which is returned to the policy-holder a sum in cash varying from fifty to eighty or ninety per cent. of the amount paid by him in the shape of premiums, the percentage increasing with the age of the policy; or the insurance, whatever its nature, may be extended for a definite period without the further payment of any premiums, until the insured has received in insurance, an exact *quid pro quo* for all premiums hitherto paid. Still another return is commonly offered to policy-holders in event of their inability or unwillingness to continue payments, in the form of a paid-up policy for a definite sum, which he is then considered to have bought outright by the payment of his past premiums, and which he may hold with absolute security without further payment, until he himself or his heirs draw the money payable upon its maturity. Various other means are often provided by which the policy-holder is assured a benefit no matter what may

occur, and it must also be borne in mind that over his membership in a life insurance company, the company itself holds no control. It is impossible for his membership therein to be dissolved save with his own consent. Thus will be seen a few of the advantages which legitimate insurance companies possess over mutual benefit and industrial associations, no matter how honestly the latter may be conducted.

It will be seen that I have carefully used the word "legitimate" when speaking of the advantages offered by insurance companies. I do so to distinguish them from the so-called "cöoperative" insurance companies which are blots on the insurance business. To everyone I would say, shun these last named organizations which are constructed on the model of railway mutual benefit associations, but which possess none of their advantages, while their disadvantages are present to an abnormal degree. A cöoperative life or accident insurance company collects its funds by assessments levied whenever a policy matures. Its managers may be the personification of honesty and intelligence, but they are absolutely powerless to enforce the collection of the assessments, and the policy-holder is dependent upon the inclinations and abilities of several thousand of his fellow members to secure the payment of his policy. In the assessment feature there is a resemblance between the cöoperative concerns and the railway associations, but the latter from the nature of their membership are infinitely superior in the character of the aid guaranteed. There is an *esprit de corps* about the railway association. Its members are pursuing the same calling, and a feeling of fellowship is fostered and engendered. Its officers and managers in most part serve gratuitously, and are conspicuous for their honesty; and the desire of its members to aid each other is followed by a prompt and generous payment of levied assessments. The members of a cöoperative insurance company are unknown to each other. There is a lack of any feeling of fellowship, and a dense ignorance as to the workings of the organization. Its officers and managers are paid generous salaries, and as a rule are not scrupulously honest. The companies possess not a single advantage which the railway benefit associations do not offer a thousand fold superior, and present drawbacks which are lacking in the latter.

If I am anxious to distinguish the advantages of legitimate insurance over the aid guaranteed by the railway associations and others of the kind, I am doubly anxious to avoid the confounding of insurance with the misty guarantees of the cöoperative concerns. In legitimate insurance each policy-holder deals directly with the company and there are no assessments. He pays for what he gets and he gets what he pays for. The equitable amount of his premium payments has been established through the experience of more than a century, and he has the satisfaction of knowing that he has a guarantee of the payment of a certain sum; not the promise of an effort, more or less feeble, to collect it in driblets from a thousand or more persons.

It is the legitimate insurance in whose favor I am writing, and I trust that it will not be confounded with any other form of aid which has adopted the generic name of insurance. But at the same time I do not wish it thought that I am arguing with an intention to damage the cause of the railway mutual benefit associations. They are of the greatest usefulness, morally, socially, and benevolently, and if a railway employé cannot afford both insurance and a membership in his association, by all means forego the insurance. It has been my object to distinguish the two in their nature and operation, and to point out the fact that insurance possesses advantages which the associations cannot furnish; and to call to the notice of all whose means will permit, the benefits which will accrue to them if they are not satisfied alone with the protection which their associations offer, but secure permanent and unfailing protection for themselves and their families by laying a portion of their means aside to obtain legitimate insurance. It is to this end I have directed my efforts, and I trust they have not wholly failed of their purpose.

AMERICAN VERSUS BRITISH RAILWAYS.

BY HENRY G. TAYLOR.

(Written for the AMERICAN RAILROAD JOURNAL.)

IN your last issue, "An Old Traveler" communicates a remarkably interesting article under the above title. He writes in an admirable spirit of fairness, and enriches railroad literature with luminous information. If, to a wanderer like myself, whose business and habit are observation, there are spots in the sun of his discourse, its merits of candor and breadth are so conspicuous that it would be ungracious to more than mention them. Moreover, in my opinion, his comparison is so nearly exhaustive that I feel little more need be said to place the matter under discussion in, at any rate, approximate completeness before the reader. At the same time more might be said in justice to an important subject than has been printed as yet, and, as I venture to believe that I have some new points to communicate to a discussion which in these days of much travel can scarcely become wearisome, I proceed to set them down, not in a spirit of controversy, but, I trust, with a dutiful regard to "whatsoever things are true."

The conditions of travel in the United States as compared with those existing in Great Britain, are so different that the distinctions developed since the institution of railways must of necessity be great, the progressive spirit being regarded as equal in both. I think that it would be fair to state it is about equal. In the course of my visits to Europe every few years, I cannot fail to see that British energy and enterprise are exemplified in the way best adapted to the needs of the country in at least as remarkable a degree as here.

In nothing are these more noticeable than in the improvements effected in third-class carriages, which are placed at the service of Her Majesty's subjects at the rate per mile of about two cents for each person. As every train is provided with a sufficient number of these carriages, I cannot do otherwise than believe that traveling is cheaper in Great Britain than here. In this country the rate per mile in the ordinary cars varies from somewhat above two cents to five cents on some lines, and I feel confident that to strike an average would be to demonstrate the truth of my statement. But this by the way. "An Old Traveler" says third-class carriages in England are "unspeakably vile." I question this statement. Many people in a good middle-class position in life use them,

especially in what our British cousins consider long journeys; and I venture to say that while there are specimens of old shabby boxes still used in local travel, the majority of the penny-a-mile carriages answer to the description I am about to give of them. They are sufficiently spacious for people to ride face to face in them with comfort. The seats are wide and shaped to the person, neatly upholstered, provided with racks, and, many of them, with drapery for the windows. They are kept clean, are certainly not soiled with tobacco juice, and as a general thing, are not full, so that the passenger has more freedom than is conveyed in the description that they are "stuffy little boxes into which the passengers are locked like a herd of cattle." Many a man who would not think of traveling at sea other than as a first-class passenger, makes himself comfortable in a third-class carriage while traveling in England. It is more than possible, not to say probable, that he may find himself the sole occupant of a box. In this case, should he be traveling by night, he might make no uneasy couch by the aid of his traveling robe, and journey from London to York, for example, swiftly and smoothly, nor unsuccessfully woo that benign goddess, sleep. For short journeys, and in a densely populated country like England, the vast majority of passengers traveling a few miles only at one time, the inconvenience of riding in a third-class carriage is certainly not greater, should all its seats be occupied, than that of accomplishing the same length of journey in an ordinary car in the United States, compelled here as there, to sit next the same person all the way, or lose the chance of sitting in a seat which ten to one cramps the body, and the iron frame of which is far from suggestive of comfort. What is here said is not intended to be a defense of the construction of carriages preferred by English railroad managers, and by the public also, but in order to inform the American reader, who, naturally enough, is apt to form an opinion of British traveling arrangements as flattering to those in use in his own country as possible.

But I am not losing sight of the fact that the compartment style of railway carriages does possess great advantages, especially where many trains have to be filled and emptied. Side doors very materially assist rapid dispatch, as no one can fail to observe who occupies a seat on the station platform of King's Cross, London, for example, and notes with assured admiration the astonishing expedition with which trains are filled and sent off, and the equal rapidity of disposing of a crowd of arrivals. Our system would not answer the needs of the English service nearly as well, and this remains true notwithstanding that the tickets are there checked by the "guard" or conductor before the starting of the train. This well-uniformed and busy person, moreover, is provided with a platform along the side of the carriage, on which he can walk without danger while the train is moving slowly, and it is not absolutely necessary that ticket checking and collecting should be done when it is standing. It being also remembered that when standing in the station the floors of the carriages are on a level with that of the platform and close to it, anybody can see that leaving or taking train is a much easier matter in England, and a more graceful and comfortable thing too, than climbing up a staircase into the car from a dusty or sloppy track. Ladies, especially, appreciate the difference. This matter of side doors is capable of further treatment. End doors to cars are frequently opened, causing a draught and a storm of dust; and let me say, without expansion, that traveling is cleaner in England than here, and that there the unæsthetic duster is not a necessity to the passenger who sets a value upon his broadcloth, or is apprehensive of mischief to her draperies.

I do not think it would be profitable to extend this discussion by mentioning other points of superiority in English railway service, as this was so faithfully done in the JOURNAL last month. In making a comparison between ours and that, the essential difference between the continental vastness of the United States and the comparative paucity of its population, and the characteristics of compactness and close-peopledness in England, should be borne in mind; our people take much longer journeys on the average, our companies provide fewer trains, and they carry fewer passengers per mile by an exceedingly large proportion. I see unwisdom in the Britisher prescribing what our railway methods should be; I see equal unwisdom in the American dictating what English railway methods should be. Companies in both countries have much to do before they provide as perfect a service as is desirable; but I do not hesitate to express the opinion that both are, as nearly as I can judge, equally intelligent and enterprising in the adoption of improvements. Both can learn the one from the other, and one can but feel in dismissing a subject both interesting and useful, that the bard was right when he said: "Comparisons are odious."

THE STORAGE AND TRANSPORTATION OF POWER.

BY GOODWIN C. RUSSELL, M. S.

(Written for the AMERICAN RAILROAD JOURNAL.)

THE application of motive power to railways and tramways cannot be considered without the greater portion of thought being bestowed upon the subject of the storage of the power in question. Nor is the storage of the power the only subject which directly bears upon its application. There is also the transportation of power which demands consideration. Steam as a motive power had long been employed before the first railway or steam vessel was thought of, for the reason that while it is a comparatively easy task to apply a known force directly as a power, more study must be applied to effect a means of storing the power, and more yet to adapt it for transportation. Scientists in the early years of the present century, readily admitted the enormous force of steam as a motive power, but at the same time there was an almost universal belief among them that it could never be adapted to vehicles, as the increased weight of the necessary mechanism would more than compensate for the power thus applied, to say little or nothing of the weight of the vehicle itself. It was thought and argued that no machine run by steam possessed sufficient force to move itself, and that an increase of force was inevitably attained by more than a corresponding increase of inertia. The familiar comparison was instituted that an engine could no more propel itself than a man could raise himself by his boot-straps, and this *reductio ad absurdum* argument was deemed unanswerable until Stephenson's locomotive and Fulton's steamboat proved its falsity.

With the destruction of this fallacious theory a new field was open to investigation, and in the interval since locomotives and steam vessels were invented there has scarcely a single month passed in which the world has not been benefited by the discovery of some new and useful appliance tending to perfect the means of applying steam as a propelling power. The weight of propelling machinery has been reduced to a minimum; its power to a maximum. No sooner has the necessity arisen for a new device to solve a minor or technical problem connected with railway or any species of steam transit, than the inventor has appeared able to furnish the desideratum. But now, as in the early days of steam transit, the storage and portability of power is a great and leading question upon which the study of scientists is constantly applied. I cordially agree with the JOURNAL in the prediction made in its editorial columns last month that steam is doomed. The world has progressed, and what seemed to meet every desire and necessity fifty years ago, is now behind the age. Electricity is the coming force which will ultimately usurp the realm of steam as a motive power, as it almost has that of gas as a means of lighting. There are to-day electric motors whose achievements are wonderful, and experimentally applied, electric railways are already in operation; but the application of electricity as a motive power possessing all the requirements that are demanded in the propulsion of carriages and vessels (and which to a great extent are possessed by steam), is an achievement of the future. As a mere power it is conceded that electricity is superior to steam. Its capabilities are far greater and in its use there would be found greater advantages. Ultimately electricity can be furnished at a smaller cost, and the waste of material could be reduced to *nil*. All of these claims of the superiority of electricity to steam as a motive power are well-known, yet the electric motor and the electric vessel of to-day are very primitive affairs. The problem of electric storage and its transportation as a power yet demand a satisfactory solution.

The spring as a power antedates steam, and yet at present it does little outside of furnishing the motive power for watches and clocks and other forms of mechanism requiring the smallest exertion of force. A spring might be constructed that would propel the heaviest locomotive and the most cumbrous vessel, but its weight would be enormous aud the power required to wind it far in excess of that which it itself would furnish. As applied to street-cars the spring could, I think, be used with success, but even here the storage of the power and its transportation would present obstacles.

Light, in itself, furnishes a motive power, and Ericsson, the inventor, has constructed a sun motor which derives its force from the rays of the sun. Many of us are also familiar with the little device consisting of two or more discs, painted black upon one side, connected with slender bars so arranged as to meet at a pivotal center and revolve with the least possible friction. Enclosed in a glass case, to exclude the action of the atmosphere, and exposed to the rays of the sun, the discs will revolve with great rapidity, the darkened faces approaching the sun and the light receding from it. Here is a power, but its utility is questionable. Once again is its storage a problematical achievement, and, as in the case of the spring, a sun motor sufficiently powerful to accomplish any practical results would be too cumbersome for transportation, and would possess the insuperable objection of being available only during those hours when the sun's rays were unobscured.

The primitive powers are those which nature furnishes equipped for use; wind and water. History teaches us that there has been no civilization, no matter how primitive, which has not utilized both of these natural forces; but their utility has increased but little with the growth of centuries, and the storage and transportation of wind and water power seems an utter impossibility. Water has never been utilized as a propelling force and wind, in that capacity, has been strictly confined to sailing vessels.

Heat, compressed air and gas, have to a considerable extent been successfully utilized as propelling forces, but they fall immeasurably behind steam in their capabilities, and the obstacles in the way of their storage and transportation are more marked. Like steam they are rapidly being superseded by electricity, and little inventive genius is being directed toward their improvement.

Were it necessary other forces could be enumerated, all of which possess every requisite save their adaptability in the matter of storage and transportation. It is not to the discovery of new forces that inventive energy should be directed, but to the utilization of known forces, by harnessing them properly for action. Power exists in abundance; its subjection and mastery is the task which demands completion,and at the outset these questions present themselves for consideration: which of all known forces offer the most promising inducements for investigation, and which, up to the present time, are best understood, both as to their peculiar properties and as to known results of which they are capable? Let these questions be carefully studied before investigation is begun, and much misdirected labor will be averted. While future years may revolutionize the application of forces, we are dealing with the present, and dealing with it in the light of present knowledge; and immediate practical results can best be realized by investigation of the known, rather than by attempted discovery of the unknown. Discoveries come fast enough but their development is the work of ages.

To my own mind the conclusion is inevitable that steam is the only propelling force that can at present be utilized, but that the termination of its era will soon be brought about by the universal application of electricity. As in the early days of steam, the question for mechanics and electricians to consider is the storage and transportation of electricity; but in one respect the difficulties to be met and overcome are not so perplexing as they were to Stephenson and Fulton and the early pioneers of steam transit. Not only in the perfected machinery and mechanical knowledge of to-day is their labor already partly performed, but, if I may so designate it, they are dealing with an intelligent force. Unlike steam, which demands heat as a *sine qua non* of existence, electricity springs into life endowed with a sense of its own and an unerring instinct. It may be dispatched along a wire thousands of miles in length, relied upon to perform its journey unassisted. Transmitted to a bar of metal it permeates every fibre and can instantly be utilized. Generated in an instant it acts upon the instant and with an overwhelming force. For this reason the transportation of electricity as a propelling force is but a secondary question, depending wholly upon its storage. In its application to railways it need not be transported at all, in fact, in the sense of carried, but can be transmitted through the rails themselves

from a central storage depot. When once successfully stored it may be applied with far simpler mechanism than the use of steam demands, and absolute safety is assured.

With you, gentlemen, the electricians who are so devoted to the development of that mysterious force, rests the solution of electric transit. To you are given its problems with their mingled simplicity and complexity; but in the light of past achievements, accomplished when the mechanical and inventive world was laboring in ignorance, there seems to be no limit to the great results you may accomplish. Surely it cannot be that the problems of electric storage and transportation are insoluble, and that these obstacles will daunt your perseverance. You have virtually superseded gas, and in a few years electricity will be the universal illuminating power. Continue your work and relegate steam as a propelling power to the past. It has served its purpose well, but the world is moving and so are its inhabitants who long for a new dynasty of force, and upon the completion of your task, and with the first successful application of electricity to railway and water transit, steam will be forgotten with the world-wide cry of "the King is dead; long live the King!"

RAILWAY STATION ARCHITECTURE.

BY M. G. VAN RENSSELAER.

[From the *Century*.]

THE railway station is a far more recent invention than even the inclosed theater. It is a child of our own century—a child of that century in which the engineer, as opposed to the architect proper, has come to play so large a role. It is unfortunate that there is this distinction, even opposition, between the two professions—unfortunate that with the advent of the railway age the architect allowed to pass entirely out of his control those structures which the engineer had of necessity to do his part. The consequence is that while this part is often performed in the most admirable way, the part which should have been the architect's falls as well to the engineer—to him who as an engineer cannot comprehend it, whom an architectural training alone would have fitted for its mastery. Nothing could be finer in its way than the interior of many a great station, especially in Germany or France, with its colossal, powerful, yet light and graceful iron framework. But such a framework can hardly be called architectural. It is spun, woven, wrought, rather than truly built; and the adjacent parts which are built commonly fall far below it in excellence and beauty.

I have already spoken of our Brooklyn bridge, which is beautiful in those features that fell naturally to engineering skill, in the lines of its cables and wires and in the delicate spring of its long roadway—as vital and graceful as though it were but a single tense strip of steel. But the towers—the really architectural features—are as poor as the iron web is fine. So it is with our great railway stations. Their walls and constructive features usually are bad *per se*, and have no organic relation with those other parts which we must be content to have unarchitectural themselves, but which might be brought into harmony with their architectural environment. A better accord between the two professions, or a wider training which will make certain men at once architects and engineers, may yet, it is to be hoped, produce more fortunate results. Exceptions to the general rule there are indeed already, especially in Germany, where we find certain great railway termini that are built with a dignity, a simplicity, an appropriateness, and an expressiveness that deserve all praise. Unfortunately we have not much to show at home as yet, beyond abortive attempts in the same direction—stations like the one at Worcester, Mass., for example, which means well, but the effect of which is, to say the least, unbeautiful. And even these are comparatively rare. So far as I have been able to judge, we usually vibrate between ambitiously inappropriate and ugly efforts, like the Forty-second street station in New York, or platitudes of an unambitious and factory-like description. A variant we do find, indeed, in the Broad street station at Philadelphia, but not a quite successful one. With its well-planned, comfortable, and even sumptuous interior we have no fault to find. It is a striking proof, by the way, of our growing demand for luxurious surroundings—a proof that would astonish the original creators of the Pennsylvania Railroad or the travelers of a generation ago. The exterior of the building, too, has excellence, if we consider it from an abstract standpoint; and certain among its features, prescribed by necessity, have been so fortunately fashioned as to be amply expressive—I mean the basement, with its great arches for the admission of vehicles, and the large windows which light the waiting-room above. But the expression of the building as a whole is far from being what it ought to be. A railroad station, above all things on earth, is utilitarian. It may and should be made beautiful, but its beauty should be of a simple, severe, and, so to say, business-like character. But for this Philadelphia station a florid type of Gothic was chosen, and was elaborated in the most ornate fashion. The design is good in many ways, and a great deal of the decoration is quite charming, intrinsically considered. But the effect is not in keeping with the structure's purpose. We gladly accept the Messrs. Wilsons' building as distinctly ornamental to a city which is in rather bad need of architectural adornment; but we cannot accept it as a laudable precedent in its own way. It is attractive, but I do not think it is very rational.

Our smaller wayside stations offer, of course, very much easier problems. They are merely waiting-rooms flanked, perhaps, by external sheds to protect the passengers and traffic; and there is, therefore, no question about bringing them into harmony with huge engineering efforts. Some improvement has been made in them of recent years, but there is room for more. The best among them are rarely more than pretty "Queen Anne" cottages, well arranged within, but hardly laying claim to architectural dignity. But more substantial work is coming into vogue, as we may see, among other instances, in several small stations Mr. Richardson has lately been building in New England. The one at Palmer, Mass., is the finest I have seen—built of stone of two colors, massively, effectively, yet simply, and in expressional accordance with its purpose. Unfortunately it is not yet complete, and cannot here be reproduced. In its stead we give a sketch of a still smaller one at North Easton.

At first sight, perhaps, the great stone arches look too "original" to the quite sensible. What is their use we ask, since there is only a roof to be supported? But they

serve good practical purpose in admitting light to the waiting-rooms in spite of overhanging eaves, and they are expressionally fortunate too, as it seems to me. Is not the general effect of the building just what it should be? Do we not see that it is the roof, not the wall, which is the main thing; that here is not a place to dwell in but to stop under; that it is not a house at all but a shed—a shed made permanent, stable, sturdy and picturesque besides? And I must enforce the point that in such work as this Mr. Richardson, who can be so exuberant at times, and at times so refined and elegant (as in Leroy Hall for instance), changes his tone entirely and becomes eminently business-like, uncompromising and severe. The Palmer station is much more ambitious than this, but it, too, is strictly utilitrarian, though by no means inartistic, depending for its effect entirely upon its structural features and the contrasted color of its materials.

If we have had one class of structures which more than another has been the very type of sordid, shabby, brutal ugliness, it has comprised those hideous receptacles for a long-suffering community known as the ferry-houses of New York harbor. But even these are coming under the healing touch of art. I may note as the most striking instance a ferry-house of Messrs. Ficken & Smith's at Hoboken—a modest wooden structure, nicely built, tastefully decorated, and showing a street front in "Queen Anne" fashion that is pleasantly picturesque and sensible withal. Here for once we have been given a sufficiently agreeable resting place for decent human creatures; and could there be a stronger proof that the good leaven is at work, and in a really radical way?

FUEL ECONOMY WITH LOCOMOTIVES.

BY ANGUS SINCLAIR.

READ BEFORE THE RECENT CONVENTION OF THE AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.

DURING the last twenty years, remarkable reduction has been made in the cost of moving railroad trains, and an important portion of the saving effected in transportation expenses is due to the labors of this association. While there is just ground for pride over past achievements, the work must still go on, for great progress must yet be made in the line of economy.

We have heard much said of late about the keen, close competition which our food producers are going to encounter in the near future from the breadstuffs raised by the cheap labor of Russia and India. A factor in this problem, perhaps more important than the original cost of production, is the cost of handling and transportation to market. The vital struggle in this race will probably be decided by taxing the ability of our railroads to make still greater reductions in the cost of moving the produce of our Western farms to the seaboard. As the locomotive department nearly always receives the first attention when a demand for reducing operating expenses arises, I shall endeavor to suggest how important savings might be effected without impairing the efficiency of the service.

Although the American locomotive compares favorably with the average stationary or marine engine in the economical application of power, there is still room for improvement, as can be proved by a comparison with the work done by locomotives in Europe of similar dimensions to ours, while doing similar work.

During the month of March last the engines running the Chicago Limited Express on the Pennsylvania Railroad, between Jersey City and Philadelphia, burned 63.35 pounds of coal per train mile. Some engines on other roads doing similar service, and burning bituminous coal, show a slightly better duty; but the Pennsylvania locomotive may be accepted as a fair average of American locomotive practice, with two or three notable exceptions. On a good representative road in this country a Mogul engine, with cylinders 18 x 24, pulling twenty-five loaded cars, on an average, burns 120 pounds of coal per mile. This may be considered among us, fair economical work for a freight engine.

The famous Webb compound locomotive, on the London and North-western Railway, has been running a train of about the same weight and speed as the Pennsylvania Railroad's Chicago Limited Express over a road quite as hard to operate, with a fuel expenditure under 30 pounds to the mile. This engine may be regarded as having exceptional means for steam-saving, but the best engineering authorities in England contend that its performance is no better than that of many good locomotives that are not compounded. The "Gladstone," a well-known engine belonging to the London, Brighton and South Coast Railway, having cylinders 18½ x 26, burns 31 pounds of coal to the mile, while running an express train weighing about 200 tons at a speed of 45 miles an hour. From the record of work done by engines on the Great Northern Railway, I find that a freight engine, with cylinders 18 x 26, pulling a train similar to that handled by the Mogul, already referred to, and over a road whose physical features are nearly the same, does its work with a fuel consumption of 50 pounds to the mile. Many attempts have been made to explain away the unfavorable fuel record our engines make compared with those in Europe of the same size doing similar work, but these well-meaning attempts have not been convincing. If other engines are making a better record than ours, our best way towards equalling or excelling them is to recognize the truth and investigate the cause. Considerable experience with the running of locomotives on both sides of the Atlantic, leads me to believe the allegation, that greater expense is incurred in operating our locomotives than what is found necessary with British engines, to be genuine, and founded on undeniable data. I shall endeavor to point out some of the causes which I think contribute to this undesirable condition of affairs.

Proper investigation would probably identify several causes as contributing to the unfavorable record of the American locomotive. However good an engine may be, it is not likely to make an economical showing unless the men in charge are interested in bringing about that result. The American locomotive engineer and fireman are second to none following the same calling for intelligence and high character, but they are not trained up in the rigid ideas of fuel economy that prevails among the enginemen of Britain. There are roads here where strict economy is habitually practiced, but they are exceptional. The average fireman on the ordinary run of roads gives no heed to coal-saving, his work being regarded as good so long as he keeps up the required head of steam. Be-

fore firemen can be blamed for this laxity, an examination of the means at their command to promote fuel-saving is necessary. An important item of heat waste is the steam thrown away through the safety-valve. Now, what aid has the fireman received from the locomotive builders and designers in restraining this source of waste? The ordinary ash-pan is made without pretense at being air-tight, and to call its doors dampers is a delusion and a snare. There is also a greater evil in this than the mere loss of heat by steam blowing off. Firemen are prevented from learning the practice of regulating the admission of air to suit the fire, so they fall into the habit of making the fire suit the full admission of air.

Let us suppose that every pound of coal consumed in the fire-box is capable of generating 14,500 units of heat, combustion being effected by the oxygen taken from twelve pounds of air. In this case there would be thirteen pounds of mixed gases heated by the heat liberated from the single pound of coal, elevating the temperature to 4,700 degrees Fahr. But locomotive fire-boxes when the engine is working need a liberal supply of air to effect complete combustion, and eighteen pounds of air to the pound of coal is low for the intense draft of our engines. To heat up nineteen pounds of gas, one pound of coal will not raise the temperature higher than 3,200 degrees Fahr.—a loss of 1,500 degrees below the other, and every additional pound of superfluous air cools the gases of combustion in like proportion.

My object in adverting to this well-known fact is, to allude to its practical effect on our loose methods of controlling air admission. When an engine is working with a heavy fire, more air is needed to penetrate the mass and affect combustion than what is necessary where a light fire is carried. But our practice is to give the same supply for both cases. The consequence is that an engine will not steam with a light fire, because the rush of air is so great through the thin coating of coal that the gases are chilled below the point of ignition. In approaching stations or long descending grades, firemen could often let the fire go light if they could regulate the admission of air by proper dampers as their compeers on British engines are enabled to do. This practice of permitting a free rush of air through locomotive grates at all times is responsible for more waste of fuel and damage to fire-box sheets than is generally recognized.

What appears to be another source of loss with us is the practice of using viciously contracted exhaust nozzles. When we reflect that induction of furnace draft by exhaust steam, is subject to the same laws that regulate the induction of a current of water by the steam jet of an injector, it seems a curious spectacle to see the exhaust steam passed from the pipes through two parallel nozzles neither of which can be central to the lift pipe or stack that the steam must use as an induction pipe. This I conceive to be a violation of the laws controlling induced currents, and its bad effects have to be remedied by resorting to means which entail other disturbing agencies. Any one who has tried to make an injector work when the internal tubes were out of line knows that he had a difficult job to accomplish. An engine with double nozzles is in the same position in regard to draft induction as the injector is in regard to its ability to throw water when the tubes are out of line. The exhaust steam does not go straight up the stack, acting like a piston to form a clean vacuum behind. Its tendency is to strike on the sides of the stack or pipe, breaking its unity, reducing its velocity, and leaving fragments of the volume behind. To overcome this obstacle to free induction, increased speed of exhaust steam is resorted to which is obtained by contracting the nozzles. This increased speed of exhaust steam is rendered necessary to prevent the scattering steam from destroying the vacuum in the smoke-box. This is not a mere hypothesis. It is the teaching of observation and experiment with engines at work.

The single nozzle is almost universally used in Europe. An ordinary engine with cylinders 17×24 inches will steam freely with nozzle five inches diameter, giving an opening of 19.6 square inches. On the elevated railroads of New York, single nozzles are employed, and their standard engine with cylinders 11×16 inches steam freely with a nozzle three inches diameter, or seven square inches area of opening. That cylinder has a cubical capacity of 1,520 inches. Where double nozzles are used their diameter for a cylinder 17×24 inches is about three inches. A cylinder of this size has a cubical capacity of 5,424 inches. So the steam from this large cylinder has to escape through an opening as small as that which induces draft to make steam from a cylinder less than one-third its capacity. The result of this system is that the ordinary locomotive suffers chronically from back pressure in the cylinders due to unduly contracted exhaust orifices.

It may be said that a certain height of smoke-box vacuum must be secured to make an engine steam, no matter what kind of nozzles are employed. But facts do not substantiate that theory. Every one who has tried the two forms of nozzles knows, that steam can be made freely with a much lower vacuum when a single nozzle is employed than in the case of double nozzles. And where a decrease of smoke-box vacuum is practicable a direct saving of fuel is effected through the fire not being torn up so much by the blast. This also permits a steadier fire-box temperature since the current of surplus air is less fluctuating.

The only advantage claimed for the practice of using double nozzles, is that a single opening allows the exhaust steam from one cylinder to shoot over through the junction of the exhaust pipes into the other cylinder, causing more back pressure than contracted nozzles. This defect is due to a wrong pattern of exhaust pipe. Where the pipes are designed so that the steam is flowing in a nearly vertical direction before the junction of the pipes is reached, there is no trouble from it passing over into the other exhaust pipe. Indicator cards taken from the engines on the elevated railroads show no shooting over of the steam, and British locomotives indicate no loss from this source.

The practice very general in Europe of using driving wheels much larger than ours may have some influence on economy of heat. An engine running at a rate of forty-five miles an hour having drivers sixty-six inches diameter, exhausts fifteen times each second; an engine with drivers eighty-four inches diameter running at equal speed exhausts twelve times each second. The effect which the rapid exhausts have upon the fire appears to have received too little attention. When the period between the exhausts is long enough to admit the gases to flow with a pulsating motion, their speed through the flues must decrease between the exhausts. This would permit more of

the heat to be abstracted for evaporation. Those who are in the habit of running engines up steep grades with heavy trains, know that so soon as the engine begins to move slow the generation of steam becomes exceedingly rapid, although the engine may be working up to its highest capacity. Heavy work done under such circumstances is performed very economically, which may be due to the slow exhaust permitting effectual absorption of the heat.

While I stand second to none in admiration of the many excellent qualities of the American locomotive, I think there is a possibility of making it lighter on fuel. In working towards that end the points brought up in this paper may be found worthy of investigation.

RAILWAY COURTESIES TO MINISTERS.

[From the *Railway Age*.]

AT a recent meeting of the Presbyterian clergymen of Pittsburgh the question for discussion was: "Is it expedient that ministers accept special courtesies from railways and business men." The subject seems to have awakened a good deal of interest, and most of the fifteen ministers present gave their views upon it "without militating," as the reporter of the Pittsburgh *Telegraph* remarks, a little wickedly, "in the slightest against their economical summer touring prospects." While some of the speakers seemed to think that somebody else might think that their denunciation of corporate wickedness might be somewhat less muscular and emphatic if they accepted special favors from railways, and one of them thought that if a clergyman had a pass in his pocket the whistle of a Sunday train on that particular road might not be quite as offensive as it otherwise would be, yet it was the general sentiment that no sacrifice of principle, influence or dignity was involved in the acceptance of such favors. It was urged that ministers do a large amount of gratuitous work for the general public for which they receive no compensation. It seemed hardly right to make a clergyman pay his fare going to and coming from a funeral when his time and services were given gratuitously. The notion that railways bestowed courtesies of this kind upon ministers in order to restrain their adverse criticism was strongly repudiated by some of the speakers. It was rather because the corporations recognized the utility of the work done by the clergy and the benefit of religious influences. One gentlemen said that for two years after the adoption of the new constitution, which forbids the issue of passes by the railways which accept its provisions, he had strictly observed this provision of that instrument. He had voted for the constitution and, during that period, had acted consistently with his vote. But when the railways construed that provision in such a way as to permit them to bestow such courtesies, he had abandoned his previous views, acquiesced in the new construction and quietly accepted his passes. While none of those present believed that these courtesies were tendered to ministers to influence their treatment of the railways, yet the idea was advanced that passes were given to politicians "for a purpose." In this the good men seem to have been a little weak, both in logic and charity. The speaker who summed up the discussion thought there was a radical difference between accepting half-fare cards or passes from the railways and taking special discounts for goods purchased, etc., from business men. No duty could be influenced by the latter practice, while in the cases of railway passes the stamina of the preacher *might* be a little weakened. In this, too, the logic seems a little lame. If a minister is in danger of being too lenient to Sunday excursion trains because he has a half-fare pass, will he not moderate his denunciations of the fraud of putting shoddy cloth in garments if he gets a ministerial discount of 25 per cent. from his tailor?

We believe that, with few exceptions, railway managers do not grudge in the least the special favors extended toward the clergy. Where they seem to do so it is because they have been repeatedly and outrageously imposed upon. There are many men, who, by some grave mistake of the ordaining authorities, became entitled to write "Rev." before their names, but who have long ago drifted into other business and only remember that they have been made ministers when they wish to travel. It is the impositions of such as these which, in some cases, have caused the withdrawal of special favors from all clergymen. But the men who, on insufficient salaries and with life-long self denial, are upholding religion and morality in the towns and villages along our railways are usually treated with much liberality by those who manage the roads, and the favors are granted them with entire willingness. It is not in their attitude toward such men nor toward the sick and the destitute that our railway corporations show themselves to be soulless. This fact was spoken of by Rev. Mr. Donehoo, who, in the discussion referred to, said:

> The railroads centering in Pittsburgh do more charity work in proportion to capital than any of the corporations of this State. It would surprise the association if they knew of the sick, maimed and distressed that are carried free, the immense charity transportation that any good cause evokes. The Lake Erie Road carried without charge, all the children that the fresh air fund, last summer, boarded in the country. These corporations must be admitted to be not altogether soulless, and courtesies are not extended to ministers to secure their good will.

It is right that ministers should have sensitive consciences, but they need not fear that there is any bribery in the half-fare cards which they receive from the railways.

A MEXICAN VIEW OF THE PANAMA CANAL.

[From the *Mexican Financier*.]

RENEWED interest in the subject of international communication between the Atlantic and Pacific oceans by means of either ship canals or railways is everywhere being manifested at present. In the United States, Secretary of State Frelinghuysen recently brought the subject of the Nicaragua route before the attention of the Senate, by requesting an appropriation of $250,000 for a further study of the question and for obtaining certain concessions from the government of Nicaragua. Frequent allusions are being made by the press of Boston, New York and other large cities to the three reports on the present state of the De Lesseps canal and its future prospects. These reports, which will soon be issued from the Government Printing Office at Washington, are written, one by Admiral Cooper, commander of the United States fleet on the North Atlantic Station, the other two by Lieutenant Rodgers, of the frigate *Tennessee*, and, from certain ex-

tracts already published in American newspapers, would seem to give a complete and impartial review of the situation.

The progress of the works of the De Lesseps canal and the general situation on the Isthmus of Panama is of great importance to the future commerce of Mexico. Judging from the geographical position of this country, its present spirit of progress, its rapid advancement in political power as a nation, its natural right by reason of its preponderance of population, of extent of territory and resources, to act as leader in the politics of Central America, it is not rash to indulge the belief that this nation will some day absorb Guatemala, Honduras, Nicaragua, Costa Rica, San Salvador and the States of Colombia, forming thus one great and homogenous Spanish-American Union modeled upon that of the United States of America.

Should this ever occur, the operations of the Panama canal would be of most vital importance to Mexico; in fact this country would then, to a certain extent, control the practical workings of the canal. As the situation now exists she is not, and cannot be, an indifferent observer of the progress of Count De Lesseps' pet scheme. The opening of the Panama canal will give to all the Mexican ports upon the Pacific coast, as Acapulco, Colima, San Blas, Guaymas, and Mazatlan, a cheap and speedy transit for their exports of coffee, rubber, minerals, woods, skins and dye stuffs, now sent across the Isthmus of Panama by rail at extortionate rates of freight (in some cases amounting to five cents per pound), and then reloaded on steamers for shipment to various American and European ports, or freighted around the Horn, as is still the case to a limited extent, in sailing vessels.

The ports on the Gulf coast, as Veracruz, Tampico, Tuxpan, Progreso and Campeche, will have opened to them rapid and cheap communication by water with all the many important commercial cities along the coast of Chile, Peru and Bolivia. In proportion as the agricultural interests of Mexico are developed, the demand for guano to fertilize its wheat, corn and tobacco fields will increase, and the guano of Peru will then come directly to us, via the Panama canal, instead of by a circuitous route of many thousand miles.

It is stated by a Panama correspondent, that should the construction of the canal proceed at the same rate of progress as at present and during the past six months, it will require at least twenty-three years to complete it and open to commerce this great waterway. In less than twenty years from now there will surely be direct railway communication from the City of Mexico to the Panama canal, and, by means of lines now building or projected, from the Isthmus of Panama on down the South Pacific coast to Valparaiso, Chile. The Mexican Southern Railway, which is now resting in abeyance because the concessionnaires have not as yet succeeded in raising the necessary capital, will undoubtedly be built in the near future and will open up the State of Oaxaca, the richest mineral district in Mexico. This trunk line will naturally connect with the extensive system of railways now being constructed with great rapidity in Guatemala, and thus in a few years Mexico will be put in direct communication by rail with all Central and a great part of South America, as she now is with all parts of the United States.

No effort of the imagination is required to forecast the great future in reserve for this country as a result of the certain extension of her railway connections, and her consequent political and commercial relations with her neighbors in Central America, whose manifest destiny seems to be that they should become united to Mexico for the formation of one great Spanish-American confederation.

An editorial in the New York *Herald* of June 19, says: "It is of the greatest importance to cultivate commercial relations with Mexico, because it is through that country that the great markets of South America will eventually be most easily reached." So the conviction is spreading that in a few years Mexico will become a great power, holding in its grasp the key to the commerce of the entire American continent.

Corroborative Evidence.

THE contrast drawn in the June issue of the JOURNAL by "An Old Traveler," between the English and American railway systems has provoked considerable comment. *Apropos* of the subject and corroborative of the ground taken by the writer, the *Railway Age* in an editorial note remarks: "A recent letter states that Pullman cars are 'dragged in solitary emptiness in the center of the Scotch Express,' the reason assigned therefor being that they are 'too public.' It was a long struggle to have the cars introduced on two English lines, and perhaps America is behind in her palace car system, but what is to be said of the observations of leading foreigners, who, upon their return to England, have pronounced the system of American passenger railroading the finest in the world. We may add in passing that the English persist in not adopting the convenience of the American system of checking baggage, and who is it that has been abroad who has not witnessed the most miserable confusion at the arrival of every train. Thousands have pronounced the baggage business as absolutely one of the most unpleasant features of travel on the continent."

The Proposed African Railway.

THE London *Telegraph* in speaking of the proposed railway in the Northeast of Africa, remarks that "the inevitable expedition will have to go by the route which nature indicates and man has followed since the days of Cambyses—that is to say, by the Suakim-Berber line, which is the nearest passage between the Red Sea and the Fifth Cataract. Just as certain it is that a railway connecting these points will prove the indispensable adjunct and instrument of the undertaking. The narrow gauge line which we can and must lay would go up with the troops, water, feed and support them, connect them at every hour with the sea and supplies, and continue to exist and to be profitable when the last British soldier had quitted Suakim. Long ago such a line ought to have been constructed. It has been contemplated ever since the early days of Ishmall, and Tewfik would have established it, and Hicks defeated the Mahdi. We ourselves observed, when the discussion first arose about dispatching Gordon, that 'the best possible governor-general for the Soudan would be the Berber-Suakim railway.' Even if Egypt expended the money for its construction, it would prove the wisest outlay she ever made; but, as a part of the cost

of the campaign of relief alone, it would save vast sums, and may be considered, indeed, as a *sine qua non* of the enterprise, and the first and most important business to take in hand, when once the word is uttered that all these people who look to England for succor are not to perish. Of course the railway thus contemplated must be cheap and simple. Experienced contractors affirm that a narrow gauge line can be laid over the easy country in question at the rate of five or six miles a day. The distance is about 280 miles, and allowing for preparations and organization, it could be finished, whatever the weather, in four months. It is estimated to cost £750,000; but then it would be a property, and a very good one, sure to develop commerce and intercourse, and 'smash the Mahdi' by the means most fatal to him. Fifty miles of the metals are lying ready at Woolwich; the ironmasters of the Midlands could supply 100 more at short notice, and the rest could soon be provided. Payment, slender enough in the eyes of the British navy, but dazzling to an Arab, would set the tribes of the desert to work night and day upon the job, and every league completed could be protected by armed trucks and engines, which could be held like Mobile fortresses. Water may be got in quantities by means of tube wells wherever the Arabs find it in driblets, or might be run up and stored in tanks; and all the way to within fifty miles of Berber there are springs; while at Kobreb, on high ground, there is quite a beautiful oasis, fit for a sanitary station. Moving up by this swiftly built line—which would have no great elevations to climb, and no serious hollows to bridge—the column of rescue would arrive at Berber, probably with little or no fighting, for even the fiercest tribes would know the Mahdi's reign to be over when the railway echoed from Mount Erkoweet."

The Block System in England.

ABOUT ninety-four per cent. of the double mileage of the railways in England and Wales is now worked on the absolute block system, and the greater portion of the single lines is under the same control, in addition to the train-staff system. In Scotland the double mileage worked by the absolute block is ninety per cent. of the whole, and in Ireland twenty-two per cent.

American Locomotives in New Zealand.

A CORRESPONDENT of the Chicago *Tribune* writing from New Zealand, thus speaks of its railways: "As in other colonies, the railways here are the property of the government. I hear of one exception in the south end of the North island, where a short line is being built by a company of private capitalists. It is whispered as an open secret that the builders of the line have the pipes laid for selling it to the government when completed, at a handsome advance on its first cost. All the railways I have seen in New Zealand are narrow gauge. Passenger and other cars are built here, while the great majority of locomotives are from England, the small remainder from the United States. While in Dunedin I noticed a handsome engine standing at the depot bearing the imprint of "Baldwin Locomotive Works, Philadelphia, U. S. A." The engineer, in reply to my inquiry, said that master mechanics and engine drivers liked the "Yankee" engines better than English built ones, but the railway officials who did the buying insisted on sending "home" for their purchases. Another Yankee innovation found at Dunedin —on the forty-sixth parallel of south latitude—attracts special attention. A cable railway a mile long through one of the principal streets, and up a grade that would be impracticable for horses or traction engines, claims and secures tribute to American genius from thousands of daily patrons.

Does the Piston Stop at the End of the Stroke?

PROFESSOR DE VOLSON WOOD, in a communication to *Science*, in which he points out that there is the same difficulty in the fundamental conception of the method of limits as of the infinitesimal method in calculus, says in support of his position: "A student learns to repeat with ease, 'Velocity is rate of motion,' and thinks he understands it; but I have had many such ask, 'In a mathematically perfect engine, does the piston stop at the end of the stroke?' 'Does it remain at rest any time?' 'How can it reverse its motion, if it does not stop?' 'How can it cease going in one direction, and move in the opposite direction, without stopping between the two motions?' These are critical questions, lying at the very foundation of all change of motion. Does change in the rate of motion take place *at* an instant, or *during* an instant?"

A Significant Circular.

THERE is much significance in the following circular issued by a Western railway and addressed to its conductors. There has evidently been a "leakage" somewhere, and the demand for reform is most imperative. Probably the circular would be of interest to the managers and conductors of other roads for whose benefit we give it in full:

"Notwithstanding the explicit instruction given on certain points enumerated below, there has been a laxity in the observance of same that must be corrected; to wit:

1st. Punching tickets when first presented and in presence of passengers. This rule is by no means fully carried out. Many conductors—passenger as well as freight—make their collections without canceling, and punch tickets subsequently, when convenient. This deviation *will not be permitted* hereafter, in any case, and a full compliance with this rule is insisted upon.

2d. Collection of train rates. The tariffs and instructions plainly notify conductors what rates are to be collected on trains, yet it is known that many deviations are made therefrom, and the reports bear a number of undesirable notations, giving such excuses as "*charity*," "*all I got*," "*late for train*," "*all he had*"" "*broke*," "*had ticket to* ——," etc., etc. These excuses are not acceptable, and show no persistent effort on the part of the conductors to enforce the rules. If *all* conductors would *earnestly* and *faithfully* carry out their instructions, the collection of *full* train rates would be found a comparatively easy matter. Then passengers would not expect anything else, and would naturally anticipate complying with the company's regulations; but when a *part* of the conductors are lax in this respect, and only a part strict, *a sure foundation for trouble*, annoyance and demoralization is prepared for all concerned, and it becomes difficult and unpleasant to enforce the rules. Therefore, this serious evil *must be remedied in the future*.

3d. Cash fare slips. This system has been in use for more than a year, and thus far it has been but imperfectly carried out upon the part of many conductors. *The management is in earnest* in exacting full compliance with all the rules governing the use of these slips, and has only through leniency delayed giving final caution to those who are derelict in this matter. *Hereafter a "new departure" will be taken*, and each and every conductor must understand that he is to carry out his instructions in this matter to the letter, and without deviation.

The rigid enforcement of the foregoing rules is of the first importance, and no excuse will be accepted for a non-compliance therewith.

In conclusion, the management does not by any means intend to censure

its conductors by the wholesale, nor need any conductor who does his entire duty feel that these admonitions are addressed to him; but as the neglect of *some* inevitably affects the whole, and for the encouragement of the conductor whose faithful performance of duties is known and appreciated, we cannot do less than to warn those who have in any way been remiss in the past, that *hereafter they will be held responsible* to a strict performance of the particular duties herein referred to, as well as of those otherwise prescribed."

Electric Headlights on Locomotives.

AN electric headlight is highly desirable. The lamented Du Moncel said "In the tests made on the Northern Railway (of France) the luminous rays permit of distinguishing buildings, bridges, etc., at 400 and 500 meters (1,312 and 1,640 feet), the visibility of signals is not altered, and the train thus signalled can be seen at more than 1,500 meters (4,921 feet). It is easy to understand, after these results, how much a similar system could add to the safety of night journeys, since the train itself will always signal its presence at a distance more than sufficient for those coming to meet it, or following too close, to stop in time. In cloudy weather the signal, reflected by the clouds, could be perceived still further off, and one could, even by eclipses arranged on a code, send signals which could be as well understood as a telegraphic dispatch. These signals, besides, could be produced equally well without such reflection, and could be simplified by the interposition of colored glass disks." It is certain that the ability assured an engine driver to light up the track to a distance greater than that necessary to use the power brake, contribute in itself an advantage not to be overlooked.

In Austria a recent ministerial degree prescribed this mode of lighting on all trunk lines and recommended it for all lines. In France, it seems that the electric headlight would blind the employés at the stations, and the public feared false switches, etc., and all sorts of accidents.

When.

WHEN the gauge of the Southern railroads conforms to that of the other railroads of the country the last vestige of provincialism in that great section will be swept away. The Ohio river may seem a barrier, but the bridge at Cincinnati, and those soon to be completed at Henderson and Cairo, will triumphantly overcome the obstacle, and railroad trains will be run solid from one end of the land to the other.

When the South has more cotton mills and foundries; when the coal and iron is utilized by steel-rail mills and iron works; when the forests are being turned into articles of export, implements and tools; when the great sugar districts are all brought under thorough cultivation; when corn and wheat are alternated with cotton, and clover restores the tired soil; when new railroad lines are made necessary to accommodate the increased volume of traffic; when gardens and vineyards deck the plain and ornament the valleys; when the pastures of the Blue Ridge are dotted with herds and flocks, and when new cities spring into existence in the Southeast; then will the world understand what a glorious prosperity and wealth is the heritage of the South, and will soon be possessed by it.

And its railroads will be joint participants in the gains that will reward the workers.—*Railway Register.*

New Telegraph Cables Between Europe and America.

A NEW cable has been laid between Ireland and Nova Scotia, thence to this country, by Messrs. Bennett and Mackay. The cable used in the present enterprise is undoubtedly the best that has ever been made, representing the accumulated experience gained in the construction of all previous ocean cables. It was manufactured by the Messrs. Siemens, at their works near London. Upward of 2,500 men are employed in the establishment, and 1,700 of these were employed on the present cables, for there are two of them, which extend side by side from Ireland to Nova Scotia, whence one goes to Rockport, Mass., and the other round Cape Cod to Fire Island, N. Y., and thence to New York. The aggregate length of the two is over six thousand miles. The shore ends are two and one-half inches in diameter, while the cable proper is but one inch in diameter. The conductor is formed of thirteen wires, consisting of twelve small wires coiled around a central wire one-tenth of an inch in diameter. The insulating material is gutta-percha, between which and the armor there is a cushion of jute. The first message despatched over the cable was successfully sent a day or two ago from Paris to Mr. Mackay at Rockport.

Cost of the Suez Canal to England.

A PARLIAMENTARY paper shows that the total cost to England of the Suez Canal shares (including £98,414 paid as commission to Messrs. N. de Rothschild & Sons), was £4,076,622. The Khedive has since paid yearly £198, 829 2s. (being interest at the rate of five per cent. per annum on the actual purchase money in consideration of the deferment of the right to receive dividends on such shares), and it is estimated that the amount of debt on the transaction remaining unredeemed is £3,455,406.

THE contract of the Pennsylvania Railroad Company with the Pullman Palace Car Company expires in January next. In the meantime the former company is building some experimental palace cars at its Altoona shops, to take the place of those that will be discarded with the expiration of the Pullman contract provided a renewal of the contract is not satisfactorily made. While the Pullman company may lose by the expiration of some of its old contracts, it is gaining in the completion of new. It recently entered into a fifteen years' agreement with the Canadian Department of Railways for service on the Intercolonial Railway, and it is stated that the present agreement with the Grand Trunk Railway, which ends in August next, will be extended for a further term of five years.

A RETURN has been issued of accidents and casualties reported to the Board of Trade by the railway companies of the United Kingdom during the year 1883. From this it appears that during the year 1,230 persons were killed, and 8,123 injured. The classification of the accidents shows that 11 passengers and 11 railway servants were killed, and 662 passengers and 87 railway servants injured by accidents to trains, rolling-stock, and permanent way; while 114 passengers and 543 railway servants were killed and 754 passengers and 2,373 servants were injured by accidents from other causes.

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NEW YORK, JULY, 1884.

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TO OUR READERS.

IN our endeavors to conduct the AMERICAN RAILROAD JOURNAL as a monthly railway magazine and review, we cordially invite contributions to its columns. Whether they treat of railways or tramways, management, construction or inventions, whether they be mechanical, narrative, legal, or discursive in their nature, they will be equally acceptable, provided they are well-written and of conspicuous interest to our readers. Nor do we ask that such contributions shall be gratuitous. The laborer is worthy of his hire, and for all accepted articles we shall pay a fair sum upon their publication. Every communication sent us with a view to publication, will be carefully examined and if deemed suitable, accepted. If unavailable for our purpose it will be returned upon receipt of postage. Let every reader of the JOURNAL consider these words as addressed to him personally, no matter what may be his occupation, and out of the fulness of his wisdom or experience, let him essay to contribute a readable and valuable communication to our columns, with the assurance that his efforts will not be unrewarded and that he will have benefitted the industry with which he is connected.

PORTABLE RAILWAYS.

AN interesting feauture of the proposed British military expedition for the relief of General GORDON in the East, was a "flying railway" for the transportation of troops and supplies. The construction of the road was to be as light as was consistent with safety, and it was expected to complete the railway within three weeks after effecting a landing of the material. As prepared for shipment, the proportions of the material are given, with the rails 21 feet in length and weighing 26 pounds to the yard; the sleepers formed of ¼ inch iron plates with an "M" section, 6 inches wide by 3 feet long; and the engines of 15 or 20 horse power with a drawing capacity of about 40 tons. The guage of the road was to be remarkably narrow, the rails being but 18 inches apart and attached to the sleepers by a grip.

The fall of Khartoum will in all probability modify the arrangements of the proposed expedition, and the flying railway will not be taken to the East. We will regret the omission of this feature for its success would open up a new field in railway experiments, and if thoroughly successful the feasibility of portable railways would receive much attention. Without doubt such an undertaking could be accomplished, for the obstacles are technical and would disappear after a careful study given the problem. To some extent portable railways are now in operation, but they are primitive affairs and their portability is only approximate; they may be called portable because they are not of permanent construction and were

laid for temporary use, but they lack the characteristic compactness and mobility which are the distinguishing features of anything portable. The ideal portable railway should consist of a jointed track with the rails and sleepers already attached, requiring but the laying and leveling to prepare it for immediate operation. The tedious clamping of the rails to the cross-ties should be obviated in laying the track, and all work of this sort should be incorporated in the material. The track should consist of sections of equal length, each section composed of two parallel rails connected by attached sleepers, and a simple mechanism should be devised by means of which the various sections could be joined and imbedded in the soil and form the completed road. Provision should also be made for curves, and sections of curved track should accompany the outfit of the road, together with sections on which turn-outs and switches could be rapidly constructed. The engines should be light and compact, and the cars constructed so that they may be taken apart and packed in the smallest possible compass. Such would be the perfect portable railway, and as yet we have to hear of one in practical use. No railway mechanic would say that the construction of such a road was impossible, but it presents obstacles that would require much study to overcome. There would be much difficulty for instance in devising a satisfactory means for preparing the track in sections, and probably more in perfecting arrangements for joining these sections and firmly imbedding them in the soil; but in comparison with many railway problems that have been correctly solved, such achievements would be of the merest detail. The portable railway is an absolute possibility and its uses would be manifold.

Doubtless the laying of a portable railway would be impossible in hilly and mountainous country, and it could not be of very great length under any circumstances. From the rapid, "ready-made" nature of its construction but a very low rate of speed could be maintained, and there are strong possibilities of the displacement of the rails and depressions of the road-bed; but nevertheless a portable railway could be constructed that might prove of incalculable benefit to exploring and engineering parties, and far in advance of anything heretofore attempted. The demand would be slight for such a road, but the time would come when it would be indispensable and the inventor might reap a handsome profit.

FRANCE has formally presented the Bartholdi statue to the United States, and the gift has been properly acknowledged by Mr. MORTON, our resident minister. Its arrival in New York is soon expected, and the work of erecting it upon Bedloe's Island will quickly ensue. In this country we have been very stingy in contributing funds for the pedestal, and our treatment of the intended gift has been decidedly ungracious. A contemptible feeling has been manifested that in the presentation of a munificent gift, France was "putting up a job" on us instead of showing us a generous and hearty courtesy; and the press is not wholly blameless in propagating this base and groundless suspicion. But now that the statue is on its way, little difficulty may be anticipated in raising funds. People are slow to subscribe for any project whose consummation is a contingency of the remote future, and for this reason probably, there has been difficulty in the past. When the statue is landed on our shores, and the collection of a hundred thousand dollars is all that stands in the way of its erection, the pockets of public-spirited citizens will open quickly enough, and a very few days will see the necessary amount subscribed.

NEWSPAPER CHEEK.

WE are in receipt of a communication from a lawyer in this city, requesting us to become parties to a "test case" in which the publishers of periodical papers are supposed to be deeply interested. The first point to be "tested" is the following:

"Whether a publisher can send a paper without any order at all and then collect on the ground that the paper had been taken from the office."

We read as far as this and it was enough. It is unfortunate for the journalistic world that it should be infested with persons whose energies are directed toward devising means to outwit the public, but such is the case, and the above proposition is an outgrowth of a desire on the part of publishers to increase their circulation by forcing the public to subscribe for their sheets. It is an old point, and it has been raised a score of times. There is even a law to that effect, but like all laws established through demagogism and the fear of the press, it is a miserably ineffective institution. We will apply the law to other industries and see the pass to which we arrive. Let us assume that grocers should demand a similar law (and in sober justice they are equally entitled to it), and that the principle involved should be extended to cover their business. All Mr. Jones, the grocer, has to do to "boom" his business and handle the sweet fruits of his industry, is to do up several thousand packages of flour, sugar, rice, or any of his wares, and by means of a city directory, upon each package write the name and address of some worthy and inoffensive citizen. These packages will then be delivered by wagons, and the unsuspecting domestics of the aforesaid citizens, seeing their employers' names upon the parcels, will of course deem it correct to receive them. That settles it. Mr. Jones immediately sends out his bills, and no matter how inferior the goods nor excessive the charges, he has the law on his side and can collect the amounts, because the goods were received. He will

not even accept a return of the goods in place of payment, because a law has been passed which enables him to force his wares upon whomsoever he pleases. He need not even go to the expense of employing useful commodities in his ingenuous traffic, for this most convenient law does not require him to consider the wants of his victims. He may deliver mouldy cheese at $5 per pound if he chooses, and rotten eggs at $12 per dozen. All this makes no difference; when the closely tied package with its hidden contents is once accepted, the bargain is indissolubly sealed.

Of course if such privileges were extended to grocers, they would also be claimed by butchers, and by bakers and candle-stick makers, and in a short time the law would be universally applied. Where would the public be then and what safeguards would they possess from being overrun with articles of every description for which they could not find the slightest use? With what virtuous indignation would the press assail such a law, and how loudly would a publisher protest in case his grocer should play the trick on him! But, Mr. Publisher, where would be your consistency? You claim the right of forcing your paper upon any person you may select, regardless of his wishes, and yet you complain if your grocer exercises the same right upon you. You may say that the person to whom your paper is addressed need not take it out of the post-office. But neither need your servant receive the groceries. You may say that the package of groceries bears your name and address and that your servant does not know its contents and fairly presumes that it was ordered by you. But your newspaper bears the name and address of the person to whom it was sent, and is ordinarily concealed by a wrapper; how is he to know but that it is sent him in good faith by an acquaintance or by some publisher of whom he *has* ordered a paper? You may say that you cannot possibly find use for the groceries. But it is quite as likely that the person to whom you sent your paper can find neither pleasure nor profit therein. You say that you are willing to return the groceries untouched save that the package has been opened. But the recipient of your paper is willing to return it in perfect condition save that it has been taken out of the post-office and the wrapper removed. You say finally, that publishers as a class possess political influence, while grocers do not. Ah! at last you have struck it! So because you can bully some legislative pigmy and wield an influence which may elect or defeat him at your pleasure, you belong to a favored class for whom special high-handed legislation is to be furnished. That is the ground upon which you stand when you say that what is sauce for the publisher is not sauce for the grocer.

The law which provides that publishers may mail their publications broadcast, and collect payment upon the ground that persons have received and opened mailed packets bearing their names and addresses, is a legal absurdity and its exercise a piece of unparalled impertinence. A thousand such laws may be passed and we firmly believe that not one would stand the test of constitutionality.

So far as this kind provision of the postal laws applies to the JOURNAL, we take this occasion to repudiate it. We may send sample copies to various individuals, and we cordially hope they will feel inclined to subscribe; but if they do not, we recognize no claim upon them for the amount of the subscription nor will we endeavor to collect it if they take the paper from the post-office. We might, if we chose, continue to send the JOURNAL to them for a year or more, but that is our lookout, and until they order it sent we would urge no claim.

It is hardly necessary to say that we decline with thanks to become a party to the interesting suit before mentioned. It is true that there are a few more nice points that are to be tested, and one is so particularly refreshing in its bland simplicity that we quote it for the admiration of our readers:

"Whether in case a person does not want a paper and orders it stopped, but by some omission it is still sent and is taken from the office, there can be a recovery."

This and more to a similar effect will make up the test case which is to be taken to the Court of Appeals. There are two or three points in the proposed case which are worthy of consideration, but accompanied with such flagrant items as the above their merits are forgotten. We regret to see that the names of a number of leading journals appear upon the list as having agreed to enter the suit and urge a favorable ruling on the astounding points we have enumerated. It is not to their credit, and for their own sake as well as for that of all respectable journals, we trust the case will be defeated in the courts. Were these provisions to be established as law the only effect would be to injure the publications. No persons in their right minds would think of taking a strange paper from the post-office, and the employment of specimen copies as a means of extending circulation would cease to have the slightest effect.

THERE is scarcely a chance that this country will escape a visitation of the cholera with its attendant horrors, and the sooner we put ourselves on the defensive the better. As remarked by the eminent German authority, Dr. KOCH, with such centers as Marseilles and Toulon, the cholera must spread everywhere, and its arrival in America is probably but the question of a few days. If the disease once gains foothold in this city, teeming with a foreign population and subject to constant immigration from every quarter of the globe, its dissemination throughout the States will largely be effected by means of the various railways. While the latter are powerless to

avert the calamity they should not neglect a single precaution in mitigating the chances of a wide-spread epidemic, and the observance on their part of a few simple sanitary rules, might be of the greatest benefit. Their cars should be thoroughly ventilated and cleaned, and especial attention given the closets, which should constantly be treated with powerful disinfectants. Railway stations should be similarly purified, and railway employés instructed in those sanitary and hygienic rules which experience has taught is the only weapon with which cholera may be successfully confronted.

THE MISSION OF RAILWAYS.

IT may be regarded as a settled truth that the great object of all railway construction is to make money for the promoters and stockholders. All pretense to any other object would seem ridiculous, and if there were no distinction between the mission and the object of railways, our remarks would conclude with the initial sentence. But to make money all enterprises must do something—they must accomplish some ends, and these ends are very different from the mere object of money-making. They are the missions of the enterprises, and it remains to determine what are the precise ends accomplished by railways, and what should be the chief end for which they strive.

In general it may be said that the mission of railways is to afford means of travel and communication. That is a safe assumption, but it is open to dispute whether this end is best accomplished by regarding the present or the future. Not only must railways be built to provide means of inter-travel between towns and districts already populated, but there is a further and possibly a higher mission for them in the development of territory. There are vast tracts of land in every large country which are uninhabited simply because there is no railway accommodation in the region round about. Railways are not constructed in these regions because the regions are uninhabited, and thus there is a deadlock between population and railway enterprise. Each is waiting for the other to move. It is for railway capitalists to consider the situation; for no matter what their power and resources, from the nature of things they must take the first step in breaking the deadlock. Let railways be constructed and a population will follow fast enough. The West has been built up and populated through the enterprising construction of railways in fertile and convenient sections of country, and there is much room yet for the further encouragement of colonization in more remote yet desirable portions. It is without question very pleasing for the railway capitalist to feel that the moment a railway is put into operation there will be an enormous patronage from the towns along the line, and it may be very unpleasing to feel that years must elapse before the travel upon some railway through a wilderness will pay the cost of maintenance, but shrewd heads look beyond this. It is the mission of railways to develop the vast wilderness; and by affording means of travel to prospective residents, the latter will come of their own accord. Let a railway capitalist be also an extensive landowner, possessing thousands of fertile yet uncultivated acres in some remote territory, and he is quick to recognize the fact that railways are not only the legitimate outgrowth of population, but that population is also the legitimate outgrowth of railways. In the latter case the profits of a railway are chiefly an outcome of the future, but they increase rapidly when once started, and the wise and far-seeing man is content to wait, For evident reasons landowners are the most enterprising of railway promoters, and to that extent the accumulation of vast landed property which is so feared and decried by Mr. HENRY GEORGE and his disciples, is of incalculable benefit to nations possessing a large territory.

Not only is it the mission of railways to begin the work of development but also to maintain it and grow apace, taking care to be even a little in advance of it. It will not do for a railway to be scant with its train accommodation, promising to increase it when the travel will warrant it. To maintain and increase the work of development the train accommodation should be slightly in advance of the requirements of the towns and settlements on the line, and if this policy is entered into and continued the railways will find that the development of the territory will quicken accordingly. It should be borne in mind that railways possess an enormous initial power—more probably than any other factor of the times in which we live. It is for them and for them alone to overcome the inertia of territory, and failure is almost impossible. There is scarcely a man that cannot call to mind some town possessing every advantage save one, and that one is indispensable. The town may have a dozen railways running through it and it may be but a trifling distance from some important business center; but if train accommodation is lacking, if the latent growing capacities of the town are neglected and but a scanty train accommodation offered because the present travel does not warrant more, the growth of the town is stunted.

Let us assume that a body of capitalists are desirous of constructing a railway through sections of the country in which they have a landed interest. It is their intention to build up and devevelop the towns and villages in the neighborhood, and also to plant the seeds of new settlements whose futures may be great. Let them construct the road and let them for the moment fancy themselves men of modest means anxious to find homes in the vicinity. Better still, let them take up their residences in the locality and be in the same boat with the settlers upon

whom they depend for the development of their land and the profit of their railway. We venture to assert that there would be a wonderful increase in the accommodation offered the traveling public in that region and also a wonderful increase in the growth of its towns and settlements. There is a good deal of wholesome efficacy in the old saying, "put yourself in his place."

The field of future railway construction in this country is immense, and this in the face of the fact that many railroads are to-day hopelessly insolvent; but the insolvency of railways is the outcome of recklessness and not of progress, and that this is the case is evidently proved by the readiness with which capital embarks in a judicious railway enterprise. Domestic and foreign gold is seeking for investment in American railways and in the year past, nearly 7,000 additional miles of railway were constructed, making a total railway mileage of 120,000 in the United States. Estimating our population at 60,000,000, which is a liberal estimate, we find that there is 1 mile of railway to every 500 souls, and thus may be realized the wonderful influence which railways exert upon the prosperity of the country. While destined to fill the purses of their owners, they have a higher end to accomplish, and the better this accomplishment, the more liberal the profits. Bearing this fact in view, it is not likely that the railway capitalists will overlook the mission of their roads, and while it has not received the attention it has deserved in the past, the growth and resources of the country are bringing it rapidly to the fore, and the future construction of railways will in all probability lose its speculative features, and become wisely digested enterprise designed to reap pecuniary profit by serving useful ends in developing the strength of the country and contributing to the prosperity of her people.

THE Brooklyn Bridge has been in full operation for nearly a year, and yet according to the report of the trustees, its receipts fall below its expenses of management. An exchange broadly hints that the bridge is being managed in the interests of the ferry company and in support of the conveyed assertion, mentions the fact that during the absence of the president of the Bridge trustees in Europe, a trustee of the ferry company performed his duties. It is further urged that the Bridge and ferry rates are the same for both vehicles and passengers, the ferries charging but one cent for passengers in the morning and evening hours. We cannot perceive the logic by which the conclusions are reached. If the Bridge cannot be made to pay with rates no higher than those charged by the ferries, little good could be accomplished by a reduction of the tolls, and still less by an increase. The Bridge is a public institution, and the cities of New York and Brooklyn can well afford a tax for its maintenance. It will be controlled for the public good, and there is not the slightest fear that the ferry company will ever be allowed to manage it to their profit. Why indeed should they wish to manage it when its expenses of maintenance are in excess of its receipts? Certainly not from motives of philanthropy.

* * *

THE presidential candidates of both political parties have entered the race, and from now until November a lively time may be expected. While possessing individual preferences, as become good citizens, we hold to the opinion that publications like the JOURNAL, with special fields and missions, should let politics severely alone, and our course of action will be undisturbed by the agonizing warfare of a presidential campaign. One thing we do believe, however; we believe that the country is strong enough to stand and hold its own no matter who is in power, and all talk about the country going to the devil in event of this one or that one being elected is sheer nonsense.

Hints for Sanitary Engineers.

[COMMUNICATED.]

To the Editor of the American Railroad Journal:

DEAR SIR:—The writer stepped over to see one of his neighbors, some time since—an engineer of the sanitary persuasion—and found him rather gloomy and dejected. "Why thus?" was the natural and emotional inquiry which his appearance suggested. "Why thus?" he said, "it is much worse than 'why thus;' I am packing up to leave. My business has led me to believe that civilization is dangerous and is antagonistic to life. I can see that death is cavorting around, on his pale nag, with an improved mowing-machine. In the first place, to make a schedule of all of the ways furnished now-a-days, to help a person out of this life, would be a hopeless task. I have read of late in the papers, of so many ways of adulterating food, that I believe the mania for slow poisoning is revived. No one in particular, wants to poison anyone in particular, but everyone seems to be willing to put anything into anybody else's stomjack; if he can place a percentage into his own pocket by doing so. Then the pharmacopolist is about as mean as the provision dealer, and the doctor comes in, tries to find out what is the matter, and puzzles over it, until the undertaker enlightens him, and ties a black pennant to the door-knob to inform the neighborhood also. Then as to my calling, and that of the plumber, we can beat them all. My profession is of vast importance to the community, but we have to cope with ignorance and stupidity combined with cupidity. These three substances (as the chemist would say), are held by a powerful affinity. It is a combination that has to be broken up.

"I am afraid," he continued, "that I cannot maintain my position. There is a diversity of opinion respecting the different systems of drainage. I have committed myself to the one, which is the best, but has the least 'money into it' for the councilmen, and there is where the shoe pinches my foot, and is raising a corn almost as big as a hay stack."

He began to explain things more in detail. "You see," said he, "there is no trouble with a large sewer; all of the surface water goes into it and you get rid of it (the stuff) at once, and your streets are not torn up, and cut into canyons, and gulches, and every time it rains your sewer is cleaned out. It costs more money at first, but in the end is cheaper than the other plan, for in addition to the cost per foot of the small sewer, there are patent things with it which don't count at first. They flush it, they say, of course, when they are flush of water, but it is not always attended to even when they are. The public functionary is not infallible any more than a savings bank director, or president. And if the darned pipe gets choked up, they have a pill about the size of your head, which they chuck into it, and undertake that system of purgation, which was so popular when calomel and jalop and blood-letting were so fashionable. I really wish you would look into this thing a little, and write it up; it needs ventilation. I am a poor writer myself, but I think that with all of the facts presented, your ready pen could do a great service to us sanitary engineers, and the public. In fact, I would hardly dare to do it myself if I could, for the owners of the patents are making lots of money, and they and the council 'in cohoots with them,' would ruin me."

He reached over from his chair, and taking some books and plans from a shelf, handed them to me, urging me to comply with his request.

Reluctantly the writer suggested that he felt entirely unfitted for the task; it was a new field of thought for him, but still, from the earnestness of the appeal he consented and after several weeks of patient study and reward, has come to the conclusion that all the systems are bad. If there are bacteria in the one they will be found in the other also. Wherever there is a stink there the bacteria will love to linger and dwell. And the more one studies and investigates, the more positive he will be that the more speedily a bad smell can be disposed of, the sooner peace and prosperity will prevail and also good health with it.

A better system, then, would be for each inhabitant of the town to provide himself with a bucket and carry his own private sewage to the river and cast it in. This would be otherwise beneficial. It would afford a wholesome exercise to many people who do not have enough of it as things are managed at present. Persons living at a long distance from the river, might find this to be at times troublesome, and persons in affluent circumstances would quite likely object occasionally, but if satisfied that upon stated days they would be privileged to shoot a large capsule of sewage into the river from the tops of their houses by means of a mortar, they would probably not object to the annoyance which their less fortunate neighbors would suffer.

These projectiles unlike the pills of the small sewage system, could always be seen in their aerial flight describing their beautiful trajectories, and if made of material suitable for the purpose, there would be no danger of their bursting in air, and yet their strength could be so graduated that they would do so upon striking the surface of the water. A reasonable amount of experiment would no doubt give satisfactory results, and no one would be so unreasonable as to complain about the temporary annoyance of any accidents which might occur during the development of the system, as the lasting blessings to be conferred upon society would so far transcend the obnoxious use of sewers as they obtain at present.

Of course this plan would injure the Major (the sanitary engineer), very much, but he is as good as ruined already. He avers that he is not a plumber and does not want to be. He has no faith in the ventilators or the cisterns, or in the pills—thinks the last will not operate, as their action is simply mechanical and not at all similar to that of the article usually prescribed and sold as such. Worse than all, should the "silent perambulator" encounter an obstacle of an obdurate nature, the diameter of which added to its own would exceed the diameter of the pipe, how are you to determine, dear readers and dear hearers, where to locate it. You can't shove a pole the whole length of the street into the pipe, and it will make the taxpayer obnoxious at the next election to tear the whole length of the street up. The large sewer is open to the objection just in proportion to its largeness. Therefore, there can be but little doubt but that the plan proposed would meet with general favor.

I. PONTIFEX, S. I.

P. S.—S. I. does not mean Sivil Ingineer but simply Staten Island. I have submitted the above to the Major. Upon the whole it is satisfactory to him but he thinks I have borne down too hard upon the large sewer, and touched lightly upon the defects of the small sewer system. However, I wrote from my own convictions and not his. He is in favor of my system, however, as it will involve military as well as sanitary engineering.

I. P., S. I.

A Freight Car's Capacity.

"A FREIGHT car doesn't appear to be a big thing, but you have no idea what it will hold until you come to crowd it once," remarked a passenger, as we passed a "boarding car" for track hands. "I'll tell you what I saw once out in Nebraska. At a station called Sutton, on the extension of the Burlington road, the whole town for about a month was one freight car. Yes, sir, just one freight car run out on a couple of old rails by the side of the track. It contained the freight office, ticket office, telegraph office, waiting room, express office, postoffice, and a real estate office, a grocery with a wet goods attachment, a small stock of dry goods, and the agricultural implement man had his stock scattered all around, and his office in the car. The railroad agent's family lived in the car, too, and his wife took in boarders. Nor that ain't all. The last day I was there I saw a sign on that car, 'Furnished Rooms to Rent,' but I afterward learned that meant a bunk in the tent on the roof. I wouldn't exaggerate about this freight car just to squeeze in a little joke like that."—*Exchange.*

Tramways.

American Street Railway Association.

President.—William H. Hazzard, Brooklyn, N. Y.
First Vice-President.—James K. Lake, Chicago, Ill.
Second Vice-President.—George B. Kerper, Cincinnati, O.
Third Vice-President.—D. F. Longstreet, Providence, R. I.
Secretary and Treasurer.—William J. Richardson, Brooklyn, N. Y.
Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

TRACTION OR PROPULSION.

THE motive power of tram-cars is at present furnished either by horse or cable traction. Steam has been used with varying success and would doubtless appeal favorably to tramway managers were not its use impracticable on crowded streets and thoroughfares. While in the future electricity is, in our opinion, destined to be the motive power of tramways as it will be of every description of railway conveyance, vessel or machinery, for some years at least, other methods must be employed, and their consideration and adoption is a question of absorbing interest to the public as well as to tramway officials.

For some time past there has been a manifest "boom" in favor of cable traction, and alive to the spirit of the times the AMERICAN RAILROAD JOURNAL has devoted much space to the discussion of the subject and is now publishing a series of illustrated articles explanatory of the *modus operandi* of a successful cable road in San Francisco. Cable traction possesses many features that recommend it with favor, and objections to it on the ground of expense are not tenable. In all undertakings there is expense, and this expense is of two kinds—expense of construction and expense of maintenance. The one ceases when the undertaking is ready for action while the other is constant, and generally cumulative. It is possible to reduce one of these expenses to a minimum, and it is safe to assume that the expense of maintenance is, as a rule, the most burdensome in the long run. The initial cost of a cable road is doubtless very large, but when once completed, the running expenses of the road are comparatively light. The advantages of a cable road are numerous and they have been presented in the JOURNAL at a length which renders their discussion unnecessary at present. Over the primitive horse-power road the cable tramway is in every way superior save in the matter of adaptability. It is far easier to obtain a franchise and a right of way for a contemplated horse-power road than for a cable road, and to this extent the advocates of horse-power, if there be any, possess a vital advantage. Beyond this there is little to be said on their side.

It seems strange, however, that while much study has been given to the subject of tramway *traction*, very little has been expended upon tramway *propulsion*. It is ap-

parently a settled conviction that tram-cars must be *pulled* not *propelled*, but no grounds exist for this wholesale discrimination. The distinction between traction and propulsion is clearly marked, but we fail to see that one is superior to the other in affording a motive power to tramways. That traction is regarded the superior is attributable to the fact that the energies of inventors and engineers have been bent in the direction of perfecting methods of traction, while the question of propulsion has been much neglected. Were each given a fair chance it is quite likely that some form of propulsion could be adapted to tram-cars that would prove most satisfactory.

In propulsion, there are general advantages. The power is carried by the vehicle itself. The mechanism is directly under the control of one man, and there is less liability of accident. A steam dummy is a fair example of propulsion as a motive power of tram-cars, and as we before stated, were it not for the impracticability of employing them in public streets, they would be widely adopted. Recently we described a spring motor employed upon a tram-car in Philadelphia, and here the inventor might take a hint for research in the fields of propulsion. Correspondents have written us for information regarding the success of the spring-motor, and we hope to investigate it thoroughly. Still another method of propulsion offers itself in the employment of gas and caloric engines, which, though having the same objectionable features as steam, possess them to a far less degree and might be so adapted to the purpose in question as to remove them altogether. Certainly the question of tramway propulsion has not received the attention it merits, and while not arguing against traction as a motive power, we would suggest that propulsion receive its due share of study in the inventive minds of tramway mechanics and engineers.

MORE ABOUT CROSS-TOWN TRAMWAYS.

IT is gratifying to note that the question which was broached in the June JOURNAL, of cross-town tramways in the lower part of New York City is being vigorously pushed. The *Scientific American* has entered the lists and urges an increased facility of inter-ferry travel, using almost the same arguments we adduced last month. But most gratifying of all is the fact that the Fulton and Cortlandt Street Ferry Railroad Company have applied to the New York Board of Aldermen for permission to lay the tracks of their proposed route. This tramway is intended to run from the Cortlandt street ferry, through Cortlandt street, Maiden lane, Burling slip and South street to the Fulton ferry, and thence returning through Fulton, Washington, Dey and West streets back to the Cortlandt street ferry.

The merchants doing business along the proposed route have objected to the laying of tracks in their streets, but we think they are not consulting their best interests in so doing. Though they may suffer some little inconvenience, the tramway would be of great benefit to their business and supply a want that has long been felt in the metropolis. The chief objection in granting the petition seems to us to be the question of crossing Broadway which the company propose to do at two separate points and on a level. With this fact in view the Aldermen should think twice before they accord the desired permission.

THERE is no better time to consider the question of tram-car heating than in the summer months. As a rule the subject is not mooted out until the approach of cold weather, when tramway managers are forced to its discussion by the complaints of their passengers; and by the time they are ready to take some action the winter has passed, and the question is once more relegated to the future. In this field there is room for the inventive genius, and no time is as good as the present for him to exercise his talents.

CABLE RAILROADS.

(*Continued.*)

BY W. W. HANSCOM, M. E.

(Written for the AMERICAN RAILROAD JOURNAL.)

IN the form of grip described and illustrated in last month's JOURNAL, the opening for the admission to and between the jaws is at the under side, so that by lowering the grip the rope will enter between the open jaws. Then by partially closing the jaws the rope is enclosed between them sufficiently to raise it, but yet allow it to freely slip through. As the rope or cable lies in a groove in the carrier-sheaves which support it along the tube, the grip in passing must be at such a height that it will not strike the sheaves in passing over them, and at the same time must hold the cable firmly. In order to start the train, the jaws are now brought together, clamping the rope gently but continuously; that is, the operation of closing the jaws on the rope for starting is to be continuous, not intermittent. Not with a very sudden movement nor a very slow movement, but one which is easily determined by a little practice. The object is to start the train gently, and yet not allow too much slipping of the cable through the jaws of the grip. To avoid the chafing of the cable and consequent wear when the cars are standing still and the cable running through the grip, four rollers are provided and attached to the grip, two being placed opposite each other, and the others before and behind the gripping jaws. These rollers are carried by two bars, one on each of the separate parts which carry the jaws, so that as the latter are moved to or from each other, the rollers are similarly moved. The bars which carry the rollers are themselves guided by studs, which have springs so adjusted as to press the bars and rollers against the cable and also to yield when the rollers are pressed hard, as in the act of gripping the rope.

It will be seen that the rollers are placed at an angle of thirty degrees with a horizontal line, and in adjusting them they are advanced about one-eighth of an inch ahead of the jaws, so that they may still hold the cable when the jaws are moved back to allow it to slip freely through them without chafing. As the jaws are again brought together, the springs behind the rollers yield and allow the cable to be clamped by the jaws with the desired force. These rollers are grooved on the face to correspond with the diameter of the cable, so that they may hold the cable within them when the jaws are opened. They are so placed in reference to the jaws that they will come in contact with the cable just before them and will serve to hold it from coming in contact with the jaws until the latter are brought close together by the wedge, screw and hand wheel, when the springs, behind the bars, which carry the rods, will yield, allowing the jaws to take the rope and move the train. And right here is one of the most important points for the man who manages the grip, to learn. That is, to close the jaws upon the cable so that in starting a train the least amount of slipping of the cable through the jaws may occur, consistent with a gentle primal motion. The greater the amount of slip of the cable through the jaws when in frictional contact, the greater will be the wear. There are the same considerations noticed in starting a train of cars propelled by a cable as in starting an ordinary railway train. Either may be started with or without shock, and the same comparative wear and tear results from the action of the engineer or gripman in either case. It has been found by experience, that starting a car gently, produces the least amount of wear upon the cable.

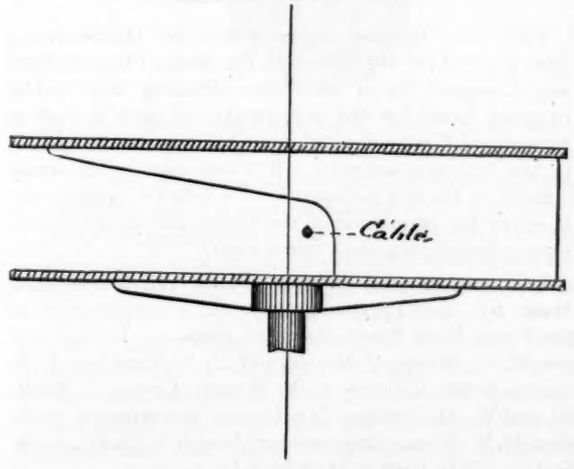


TABLE IN LINE ACROSS MAIN TRACK.

It has been before stated that the grip can be raised and lowered vertically to "pick up" the cable. The object of the construction of the Clay street road grip is that should the cable require to be dropped from the grip from any cause, or should any street obstruction prevent the cars from moving for some time, the rope can be released from the grip and avoid unnecessary wear, and can at any time or place, except immediately over a carrier-sheave, be "picked up" easily.

At the ends of the road the cable is carried around a horizontal sheave whose diameter is equal to the distance apart of the two tubes in which the cables run between the two lines of rails; that is, so that the rope will lead on and off the carrier-sheaves fairly in the two tubes. As the cars and dummies have to be switched from one line to the other, it is done on this road by two turn-tables, each table having its center line coincident with the center of the tube, and their diameter being a little less than the distance between the centers of the tubes. The turn-tables are geared together, so that when one is turned the other must move also. Between the circumferences of the tables are short pieces of track, reaching from one to the other.

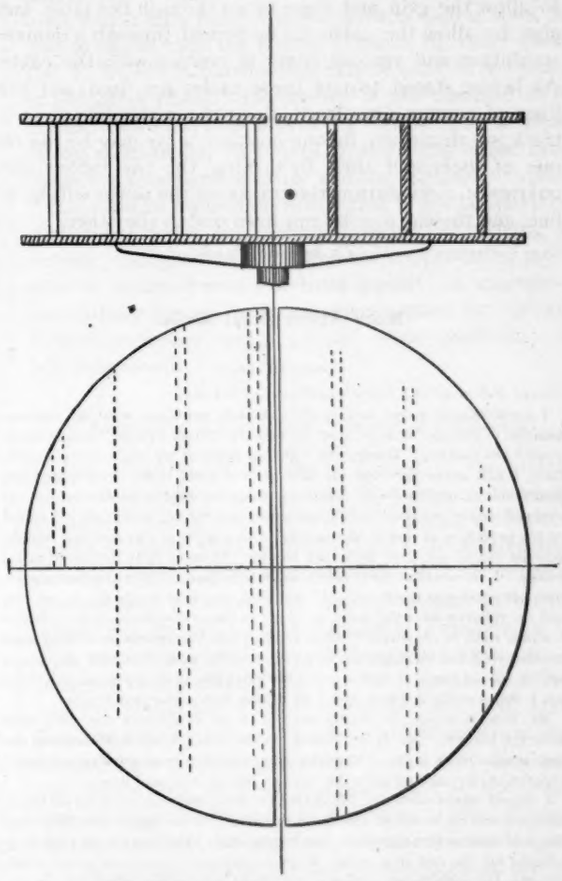


TABLE IN LINE WITH TRACK.

When a car is run on the table, it is turned one-quarter of a revolution, and this brings the rails on both tables in line, and the car is then run on to the other table; and by turning the table back again one-quarter revolution, the car is brought in position to go out on the other track. These tables are so constructed that the slot for the shank is continued across the diameter, and an opening is provided under the surface corresponding to the shape of the tube, so that the car may go on the table and be transferred across the two tables and to the other track without using the grip. The tables are identical in form, and are constructed of two plates, an upper and a lower plate; the upper plate being split across the center to allow the grip to pass, and the lower plate being whole, having under the center of the bottom a hub, from which a shaft projects downward for support, and upon which the table turns. The upper and lower plates are separated about eighteen inches, and are connected together by cast brackets, ribs

or ties, each half of the upper plate being supported from the lower plate. Not only does the grip pass through the table, but the cable itself, and as the table has to be turned one-quarter revolution, the supports for the upper plate must be so arranged that the cable will not come in contact with them when it is revolved. Therefore the supports from the bottom to the top plate must each project from not more than one-quarter of the surface of the bottom, and they must be on opposite sides of the cable, so as to support evenly the plate above.

The illustration shows clearly the construction required to allow the grip and rope to go through the table, and also to allow the table to be turned through a quarter revolution and yet not come in contact with the cable. As before stated, two of these tables are used, and the lines of centers are placed along the center line of each track, so that when in one position, a car may be run on one of them, and then by turning the two tables one-quarter of a revolution, the tracks on the tables will be in line, and the car may be run from one to the other.

(*To be continued.*)

More About Steel Rails.

[COMMUNICATED.]

To the Editor of the American Railroad Journal:

I HAVE thought it best to give the following explanation of my communication to you on "Iron *vs.* Steel for Horse Railroad Tracks," published in your April number. During the eighteen years of my engineering experience, I had never received an offer for old steel rails. I examined five years' files of my *Railroad Gazette*, containing weekly quotations for old iron rail values, without finding one quotation for old steel rails. I called on the president of one of the largest rolling mills in this country, and he said he would not give $5.00 per ton for old steel rails delivered at his works. I then wrote the communication to you. Upon the assumption that old steel was worth little, if anything, old iron worth $23.00 per ton and the relative wear the same, *no street railroad company could afford to lay steel rails in its tracks.* After sending you the article, in talking with another well-known engineer, to my surprise he said he would pay $19.00 per ton for old steel. I then wrote requesting you to return my manuscript, but it was already in print, and I let it pass with a few alterations.

Mr. Wm. Wheaton, Jr., writes me that in his experience the steel rails wear the longest. Mr. J. T. Gordon, on the other hand, has obtained the best results from iron. I candidly admitted that from my street railway experience, I could not give the relative life of steel and iron.

I cannot agree with Mr. Moxham that the conditions of wear on horse railroads and on steam railroads are the same. I do agree with him that the steel is more homogeneous, but on the other hand there is an unfailing demand for the old iron rails. Buyers constantly solicit me to sell them old iron, but with the exception noted above, no one has asked for our old steel.

The object of my communication was to get facts as to wear of both iron and steel, from the men who had used both in tracks. In other words, practice instead of theory.

Respectfully,

AUGUSTINE W. WRIGHT.

CHICAGO, June 9, 1884.

Glass Pulleys for Cable Railways.

THE Cleveland *Herald* contains an interesting article tending to prove that glass could be made to take the place of iron and other materials for certain mechanical purposes which has lately been exemplified in the manufacture of glass pulleys for cable railways. For such purposes the advantages of glass pulleys are obvious. In cable railways such as are in use over the Brooklyn suspension bridge and in the streets of some of the cities, the operation of the cables over metal pulleys has resulted in serious damage to them from the friction with the pulleys. When the pulleys are of metal the friction is a maximum one, but no other substance hitherto could be found sufficiently strong and tenacious to take its place. Glass pulleys will reduce the friction to a minimum and they will last for an indefinite time. Mr. J. J. Hardin, of Chicago, has a number of different sized pulleys made for experiment. They are about thirteen inches in diameter and about two and one-half or three in width, with a groove in the center of the rim to receive the cable. However, only the rim or tire is of glass, the interior part being composed of iron made in the form of a spider, which fully supports the glass exterior. In this spider is a hole for the reception of the axle upon which they run. The thickness of the glass from the surface of the rim to the iron part of the spider is only about three-fourths of an inch, but the glass is made extra tough and strong, and the pulleys have been proved capable of successfully resisting any pressure brought to bear upon them.

Tramways in France.

A RETURN relating to the tramway system in France gives the total length of lines at about 332 miles. The department containing the longest mileage is, of course, that of the Seine, which includes Paris. Here the length is about 120 miles. Besides Paris, the towns which have tramways running are Lyons, Marseilles, Havre, Rouen, Beziers, Tours, Nantes, Orleans, Rheims, Nancy, Cambrai, Dunkirk, Lille, Roubaix, Tourcoing, Valenciennes, Boulogne-sur-Mer, Calais and Versailles. The total receipts for all the lines during 1883 were about $7,130,000.

TRAMWAY NOTES.

THE State railroad commissioners of Massachusetts have granted the application of the Meigs Elevated Railway Company for a certificate deciding that public exigency exists for the construction of such a road in Boston and Cambridge. Formidable opposition was expected, but there was none. It is now necessary to obtain consent of the city authorities for a definite location and to secure the permission of the harbor and land commissioners for crossing the Charles river.

THE new tramway between Salem and Marblehead, Mass., has been organized under the corporate title of the Forest River Street Railway Company. Its directors are W. B. Brown, of Marblehead, J. P. Peabody, Z. A. Gallup, Frank Cousins, A. W. Mooney, George Z. Goodell, and W. D. Dennis. Mr. Dennis is temporary president, H. M. Brooks, treasurer, and Joseph F. Hickey, clerk. Stables will be built in Marblehead.

THE Aldermen's Railroad Committee, of New York City, will give a hearing on Aug. 5 to persons interested in the application of the Cable Railway and the Broadway Surface Railroad Companies.

THE adoption of the cable system is being discussed by the tramway managers of Boston and St. Louis. It is also stated that elevated railways will soon be introduced in these cities.

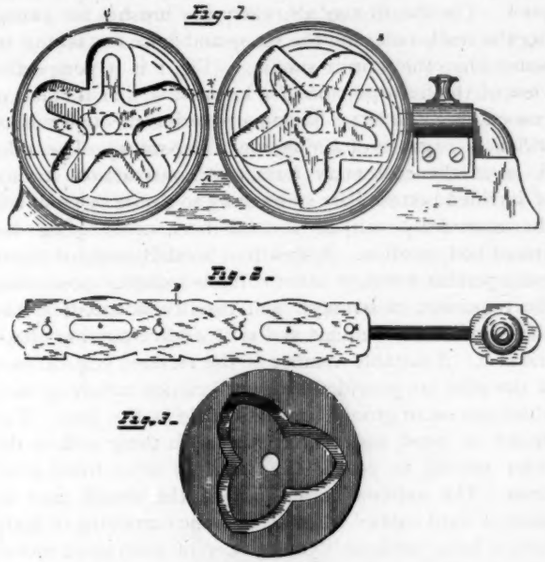
SEVENTY-SIX tramways and light railways have lately been projected in Ireland, representing an aggregate capital of $25,000,000.

THE Ashland Street Railway Company, of Madison, Wis., has been incorporated with a capital stock of $50,000.

New Inventions.

Device for Overcoming Dead-Centers and for Converting Motion.

IRVING L. HAWKINS, of Windsor, N. Y., is the inventor and patentee of a cheap and simple device for obtaining a continuous rotary or reciprocating motion and imparting it to various kinds of machinery; and also at the same time obtaining a rotary reverse motion from a single piston, overcoming the dead-center, and retarding or accelerating the motion by the application of interchangable wheels upon the same journals and piston.



HAWKINS' DEVICE FOR OVERCOMING DEAD-CENTERS AND FOR CONVERTING MOTION.

The accompanying cuts illustrate the device and its application. Fig. 1 is a representation of the invention with the fly or three-pointed cam wheel and piston removed; Fig. 2 is a view of the piston detached, and Fig. 3 is a view of the three-pointed cam wheel detached. A indicates a frame, to which are secured the axles *a a*, on which the wheels are journaled. B indicates the wheel, which is preferably placed upon the forward journal. This wheel has one of its faces provided with a waved or convoluted cam-groove, the center of which represents in outline a five-pointed star having its radial arms slightly curved outwardly and lateral to a pointed terminal forming the inner walls of the groove in which travel the two forward pins of the piston. The reverse wheel C, which is placed upon the rear journal, has the outer walls of the groove oblique and semicircular alternately, as shown, with the arms of the star conforming to it in outline, so as to have the walls of both parallel with relation to each other for the free and easy passage of the piston between them. D indicates the piston, which is provided with two elongated vertical slots *b b*, for the passage of the wheel-journals, respectively. This piston is provided with vertical pins *c c* and *c' c'*, which project from the opposite sides thereof, to engage respectively the grooves of the wheels; the two forward pins being on the same horizontal plane, while the two rear pins are arranged, respectively, on a line, or nearly so, with the longitudinal walls of the rear elongated slot. By this arrangement of the pins upon the piston, when the wheels are placed upon the journals, as before described, and the pins brought in engagement with the grooves of the wheels from one side and power applied to the piston, both wheels will be driven in the same direction; but by removing the piston and reversing it upon the wheels, so as to change the rear pins with relation to the grooves of the rear wheels, the forward wheel will be driven in the same rotary direction, while the rear one will take a reverse movement. In some cases a third wheel is used, which may have a three-pointed cam-groove, and may be placed upon the journal of one of the other wheels; and, if desired, a fourth wheel may be used on the journal of the other wheel. The device is not confined to any number of wheels or points in their grooves, as a greater or less number may be employed, according to the nature of the machine to be operated and the movement required.

It is claimed for this invention that it will be found particularly valuable in mowing-machines for driving the cutting apparatus, as a continuous reciprocating motion may be obtained with but little power. It may also be successfully applied to locomotive-engines for operating their drive-wheels, and to various other machines with a beneficial result.

Automatic Locomotive Whistle Attachment.

THE inventors of the device named in the title are Jacob W. Strickle and Harry W. Manning, of Huntsville, Alabama. Its object is to produce a simple and effective device by which the steam-whistle of a locomotive engine can be automatically sounded when the locomotive is approaching a crossing or any other part of the road where it is desired to give warning of its approach.

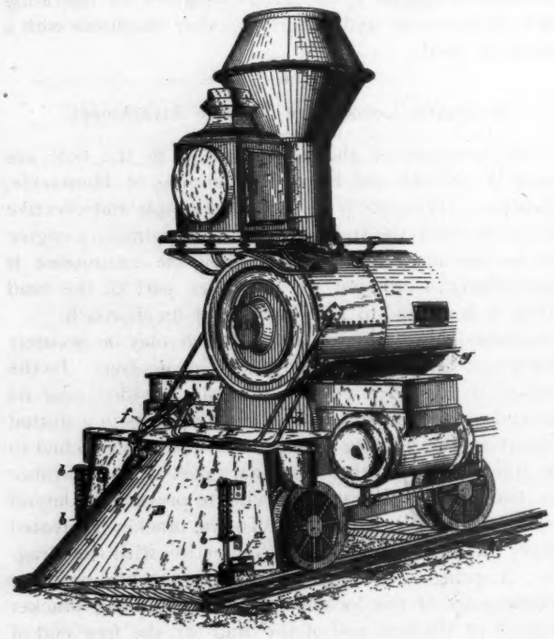
A forked bracket is provided, which may be securely attached to any suitable part of the locomotive. To the bracket is pivoted a curved drag-bar provided near its free end with an enlarged portion, which rests in a slotted supporting and guiding bracket, conveniently attached to the frame work of other stationary part of the locomotive, the slot in the bracket serving to prevent the lateral displacement of the drag-bar. To the bracket is pivoted a lever having a loose pivotal connection with the drag-bar. A spring catch is secured to the fire-box or other suitable part of the locomotive by a supporting bracket adjacent to the free end of the drag-bar, the free end of the drag-bar being preferably recessed, thus forming a small fork embracing and steadying the spring-catch. To the long arm of the lever is secured a cord or wire connected in any suitable manner with the lever, which operates the steam-whistle of the locomotive, and to the spring-catch is connected, by means of an eye, or otherwise, another cord or wire running to the cab, where it will be arranged so as to be conveniently reached by the engineer. A cam or tripping device is bolted to the ties of the roadbed within the rails, and at such a distance therefrom as to engage the drag-bar at the passage of the engine.

To operate the whistle, the engine being in motion forwards, the drag-bar will strike against the stationary cam or tripping device, raising the free end of the dra-gbar to the top of the spring-catch, which will instantly spring for-

ward under the end of the drag-bar, and thus sustain it in an elevated position. The upward movement of the free end of the drag-bar will cause the long arm of the lever to descend, by reason of the loose connection of the lever and drag-bar, thus pulling downward on the cord or wire secured to it, which, by its connections with the steam-whistle, will cause this to be sounded until the engineer causes the disengagement of the drag-bar from the spring-catch by pulling on the second-named cord or wire, when the drag-bar will fall by gravity to its first position, and thus be in readiness for the next crossing.

Owing to the curved construction of the drag-bar and the cam or tripping device, it is obvious that the drag-bar will be raised by the tripping device when the engine is moving either forward or backward; but, if it is desired to have the whistle sounded when the engine is approaching a crossing, when moving backward as well as forward, it will of course be necessary to place tripping devices on both sides of the crossings, and also near both rails, the invention being applied to the side of the engine.

Rothrock's Safety Devices for Locomotive Pilots.

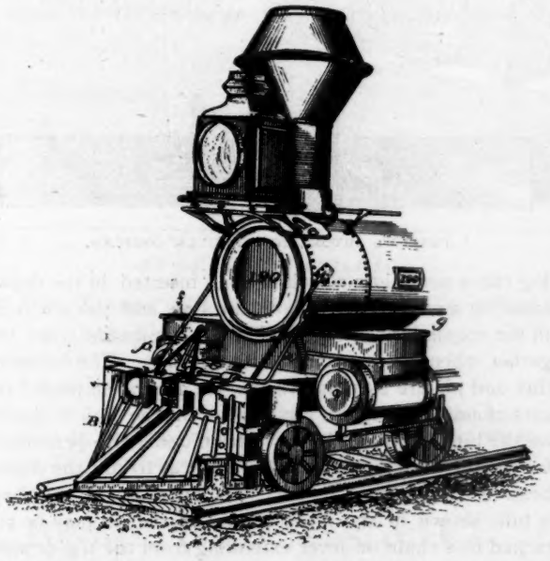


ROTHROCK'S SAFETY DEVICES FOR LOCOMOTIVE PILOTS. FIG. I.

OSCAR ROTHROCK, of Beech Creek, Pa., is the inventor and patentee of two safety devices for locomotive-pilots, which are herewith illustrated. The general principle is the same in both, the one being a modification of the other. The inventions are designed to provide safety attachments or guard devices for locomotive-pilots or cow-catchers, their object being to remove obstructions, whether animate or inanimate, from the track and prevent the train from passing over them. The pilot or cow-catcher of a locomotive, as ordinarily constructed, does not extend to the track-rails, and hence it frequently happens that an animal or other object, after having been struck by the pilot, drops again in front of it, or is brought into such a position that the locomotive and train pass over the object, consequently rendering the train very liable to be derailed and causing loss of life and property.

The first device as illustrated in Fig. 1, consists of a sheath or hood which conforms to the shape or contour of the pilot, and is made to slide up and down on the outer or inner surface of the same. The bottom edge of the sheath is provided with two notches, which receive the track-rails and permit the central portion of the shield to sweep the space between said rails. The sheath slides up and down on roller-ways on the pilot-bars, and is combined with suitable mechanism for operating it from the cab of the locomotive. The sheath, when lowered to its full extent, projects beyond the track-rails and moves in close proximity to the cross-ties or sleepers, so as to prevent effectually any obstruction from passing under the pilot. The sheath may also carry the brushes for sweeping the track-rails, and the scoop and hose for taking up water when the train is running. Fig. 1 is a perspective view of the front portion of a locomotive and its pilot or cow-catcher, the latter having a covering sheath or hood which is capable of sliding on roller-ways. The pilot A is of the customary form and construction, formed of inclined bottom bars converging to a nose or point and the rearwardly-inclined vertical bars, constituting the grated body portion. A sheath or hood B, made of metal, gutta percha, wood, or other suitable material possessing the requisites of strength and rigidity, is fitted on the outer surface of the pilot, and is of a corresponding shape and size. A suitable number of the inclined vertical bars of the pilot are provided with anti-friction rollers or balls which are set in grooves or seats made in the bars. The sheath or hood slides in contact with these rollers, the latter serving to permit the shield to move freely at all times. The extreme lower part of the sheath may be made of hard rubber, when desired, the remaining or body portion being preferably constructed of solid sheet metal. The sheath or hood, covering the pilot in the manner stated, may have interior ribs, which slide in the roller-ways of the pilot-bars, so as to prevent the lateral displacement of the sheath and maintain it always in a working position. Other means, if desired—such as guide flanges or strips—may be resorted to for holding the sheath in proper working relation to the pilot. The bottom edge of the sheath is provided with two notches *a*, which are so disposed that the sheath can pass down on each side of the track-rails when it is lowered to its full extent. Suitable holders or sockets *b*, are located in juxtaposition or in line with these notches for receiving and retaining the brushes *c*, which serve to sweep the track-rails, these brushes being of such size or so arranged that they will only sweep the rails when the sheath is sufficiently lowered; or, when the brushes encounter objects lodged on the rails, they will serve to remove them. The means for raising and lowering or operating a safety-sheath or guard device applied to a pilot and constructed in the above-described manner depends altogether upon the character of the locomotive or the position of the cab; it being understood that the sheath is designed in all cases to be under the control of the engineer, so that it can be quickly and easily operated for the purposes intended, and any suitable mechanism for raising and lowering it can be employed. In the present instance is illustrated an operating mechanism for the sheath which consists of a rock-shaft E, located at the front of the loco-

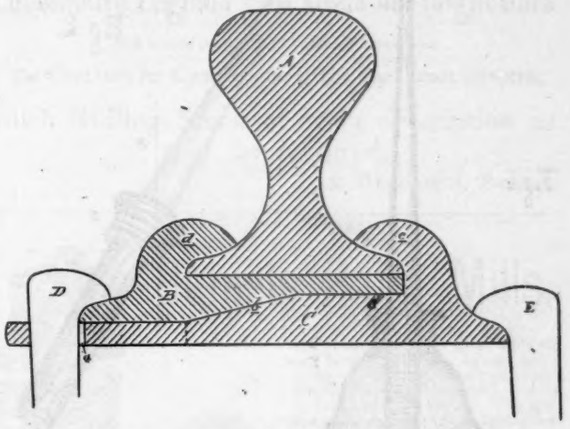
motive-truck, and having an arm *e*, connected with a link *f*, extending from the center of the upper portion of the sheath. A rod *g*, connected with an arm *h*, on the outer end of the rock-shaft, extends to a vertical lever which is located in the cab of the locomotive, and has a suitable pawl or spring-catch for locking it to a notched segment or plate, or other holding device. It is manifest that when the lever is locked in one position, the sheath is held in an elevated state, as is shown in the figure, so that the sheath will not project beyond the bottom bars of the pilot. When the lever is released, the weight of the shaft suffices to let it drop until it is again locked. When approaching cattle on the track, the sheath is lowered to within such a distance from the rails that there will be no liability of danger should an animal be struck and fall in front of the locomotive. In such an event the guard device, in connection with its rigid backing, would throw the animal to the side of the track. When obstructions exist on crossings, switches, etc., the sheath is lowered to a point just level with the rails, so as to throw such obstructions outwardly from the track. In position where no objects such as switch-rails, frogs, etc., are between the track-rails, the sheath can be lowered to within a short distance of the sleepers or cross-ties, so as to permit the engineer from his seat to throw off any object from the rails. Guide posts may be located at the side of the track for indicating the nature and position of obstructions which will prevent the shield from being lowered to its full extent.



ROTHROCK'S SAFETY DEVICES FOR LOCOMOTIVE PILOTS. FIG. 2.

Fig. 2 represents the second device for the same purpose, and it will be seen that it is a modification of the first. In the second device the sheath or hood is dispensed with and its properties are incorporated in the pilot itself. A is a beam on the front of the locomotive, having two posts *p p*, (one of which is shown in the drawing) attached on each side of its lower portion. These posts extend down to the bottom of the pilot when it is in its elevated position, and have attached to them the guides *o o*. These guides inclose that portion of the pilot marked *v v*, so that the pilot is free to move up and down. The upper portion of the frame-work of the pilot is constructed so as to provide the spaces *n n*, for the reception of the buffers and draw-head, these being separate and distinct from the pilot. The lower side portion of the frame-work of the pilot is also of a construction that provides the arches *a a*, (but one of which is seen in the drawing), for the reception of the rails when the pilot is lowered. This device is operated in the same manner as that first described.

An Improved Railway Rail.



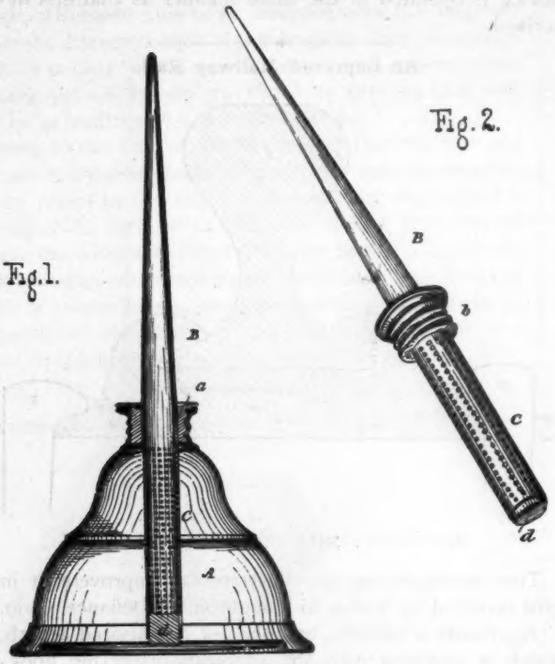
HOUGHTON'S IMPROVED RAILWAY RAIL.

THE accompanying cut illustrates an improvement in rails invented by Rufus A. Houghton, of Defiance, Ohio. C represents a metallic bed-plate of any desired length, which is provided with the upwardly-projecting hook-flange *c*. The upper face of the bed-plate C has a portion *c'*, extending parallel with its under face to a line formed by its junction with a vertical plane passing through the center of the rail, and from this line it inclines downward, as shown at *b*, until it reaches a point directly opposite the foot of the rail, when it again extends in a horizontal plane parallel with its under face, in this manner forming a broken surface. Upon this bed C rests the intermediate plate B, which is also provided with the upwardly-projecting hook-flange *d*, the under face of this intermediate plate B, being shaped to conform to the upper face of the bed C. In practice, the two plates C B are placed upon the ties, as shown in the illustration, their hooked flanges embracing the foot of the rail, the parts being held in place by spikes D E, the former of which may pass through slots *a* in the edge of the plate C, which projects beyond the plate B, the spikes being driven so as to force the hooked flanges *d c* toward each other and compel them to grasp firmly the foot of the rail. By this construction of parts is provided an interlocking device for securing the rail in place, which can readily be laid so as to break joints, while the employment of fish-plates and bolts, as generally used, is dispensed with. The device may be modified so as to dispense with the holes *a*, by forming the foot of the plate B, in such a manner that it will overlap the inner edge of the bed-plate C.

The advantages claimed for this device lie in the fact that the bed-plate as well as the intermediate plate are made with the greater bulk of metal directly opposite the hook, at the precise point where the greatest amount of strain may be expected; while the hook itself is of the shortest length consistent with the required strength.

A Patent Oil Can.

THE object of this invention, a cut of which is herewith furnished, is to provide an oil-can in which the clogging of the escape-tube by foreign matter is rendered impossible. Fig. 1 is a vertical section of the can as ready for



ENGLISH'S PATENT OILCAN.

use. It will be seen that the escape-tube B, instead of terminating at its junction with the body of the can A, extends in the form of a perforated cylinder C, almost to the bottom of the can. The lower end of this cylindrical and perforated section is fitted with a plug *d*, which may be drawn out at pleasure. The can is of the ordinary construction, and is provided with the usual screw-threaded mouth or opening *a*. Fig. 2 is a perspective view of the tube detached from the can, and its construction is evident. The tube is provided with a screw-cap *b*, and as the tube itself tapers, this cap is slid thereon and forced downward upon it until it is securely attached. The lower side of the cap is closed tightly around the section C, of the tube, so that oil can only be ejected from the can by first passing through the perforations of the tube, which strain it thoroughly, and prevent the passage of any foreign matter. The device may also be used in the construction of kerosene cans and other vessels employed for filling purposes.

The patent oil-can is the invention of Robert English, of Austin, Texas.

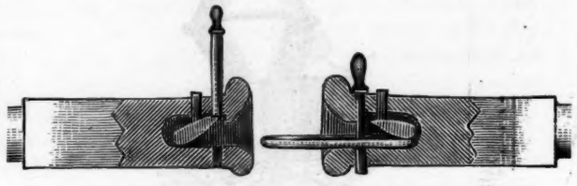
A New and Simple Nut-lock.

THE invention to be described is of that class of nut-locks used upon railway rail-joints which consist of a slotted or notched plate, into the slots or notches of which the sides of the nuts fit. Thomas Bell, Akron, Ohio, is the patentee. His lock is so made that it does not interfere with anything already on the rail, unlike some nut-locks which cut the first plate upon being fastened. It is believed to be the most simple thing of its kind yet devised, and can be manufactured at a small cost. No. 12 hooping, an inch and a half wide is needed, from which the plates can be cut. The washers can be made from No. 8 iron, one inch and three-quarters wide. A few of these nut-locks are in use on the Cleveland, Akron and Canton sysem, with satisfactory results. They hold a hexogonal as well as a square nut,

The peculiarities of Mr. Bell's nut-lock are best indicated in his claim, which is the combination of two nutted bolts, two wire loops slipped around the bolts below the nuts, and a plate fitting with its ends between the nuts, the ends of the plate being notched correspondingly to the nuts, and held in place by the ends of the wire loops passing through perforations in the plate, and twisted together; also the combination of two nutted bolts, two wire loops slipped around the bolts inside the nuts, washers having sector-shaped notches and fitting upon the bolts inside the nuts, and a plate fitting with its notched ends between the nuts, the notches in its ends corresponding in shape to the shape of the nuts, and held in place by the ends of the wire loops passing through perforations in the same, and twisted together upon its outer side.

An Automatic Pendulum Coupler.

ISAAC H. TRABUE, of Louisville, Ky., is the inventor of a car-coupling device that commends itself on the grounds of simplicity and cheapness. As seen in the accompany-



TRABUE'S AUTOMATIC PENDULUM COUPLER.

ing cut, a pendulum attachment is inserted in the draw-head, by means of which both the link and pin are held in the required positions until the draw-heads come together, when the cars couple automatically. The common link and pin are used and the device may be employed on cars of uneven heights. In this event the link is placed on the higher car and is drawn from under the pendulum far enough to hang in such a manner as to suit the draw-head of the approaching car. The operation of coupling is fully shown in the illustration, and the pin may be attached to a chain or lever extending from the top or side of the car. The pendulum will sustain either a straight or bent link. The device is sold for a trifling sum and can be readily attached.

The Lake Shore and Michigan Southern Railway Co.

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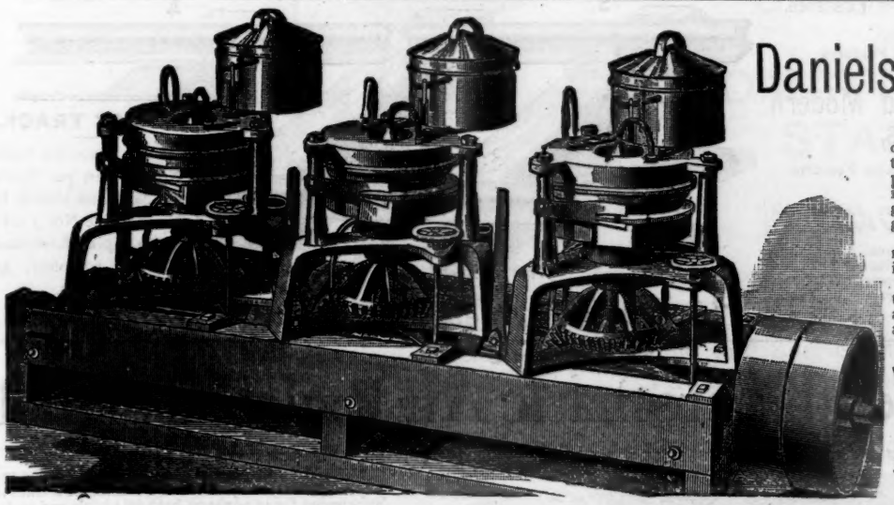

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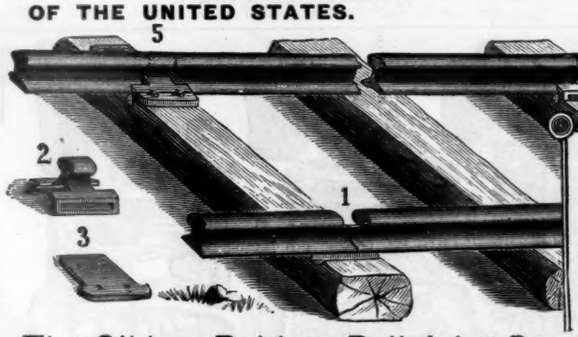

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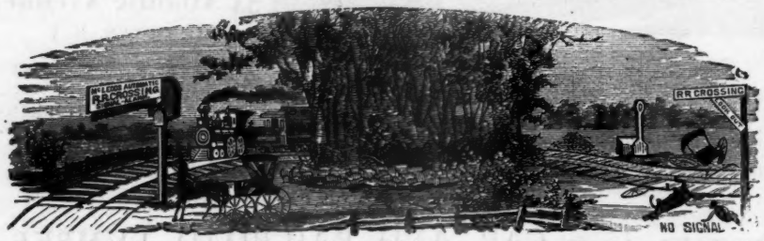

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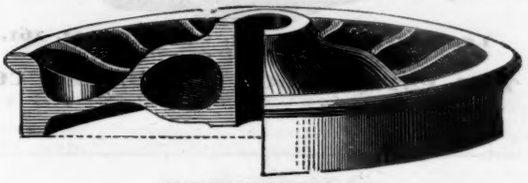

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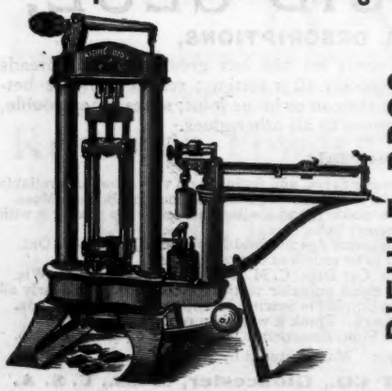
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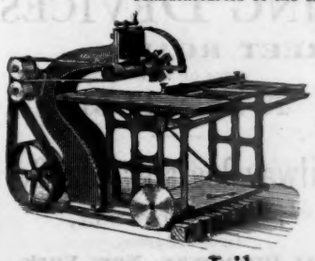

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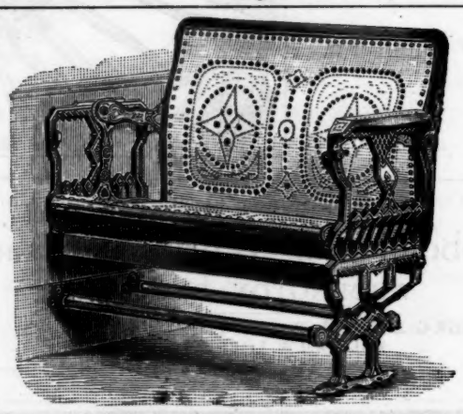

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